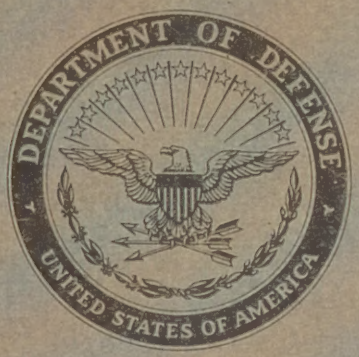
The Department of Defense
RESEARCH AND DEVELOPMENT BOARD

FACILITIES FOR RESEARCH AND DEVELOPMENT IN THE MEDICAL SCIENCES WITHIN THE DEPARTMENT OF DEFENSE



Prepared by

THE COMMITTEE ON MEDICAL SCIENCES

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The Department of Defense
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Washington 25, D. C.

Prepared by:
THE COMMITTEE ON
MEDICAL SCIENCES

Approved: Francis G. Blake

FRANCIS G. BLAKE
Chairman

FOREWORD

During 1948 and 1949, the Committee on Medical Sciences visited various medical and allied facilities for research and development in the Department of Defense. The data obtained during these visits have been consolidated and are the basis of the present report. Information presented herein deals with the location, physical structure, organization, command, special equipment, and personnel of each facility. A statement is included regarding the assigned mission and the broad programs under investigation at each facility. Where individual projects are listed, they are considered part of the research program of the fiscal year 1949; in many instances these projects continue into FY 1950.

The present report does not cover facilities outside the United States proper. It is possible that a supplementary report on such facilities will be prepared during the fiscal year 1950. The following facilities fall under this category:

ARMY - 1st Arctic Test Detachment, Fort Churchill, Manitoba, Canada. 406th Medical General Laboratory, Tokyo, Japan.

NAVY - Naval Research Laboratory, Point Barrow, Alaska.
Naval Research Unit No. 3, Cairo, Egypt.

AIR FORCE - Arctic Aero Medical Laboratory, Fairbanks, Alaska.

JAMES E. McCORMACK, M.D.
Executive Director
Committee on Medical Sciences

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1. ARMY FACILITIES

1.1 Medical Division, Army Chemical Corps.

Location: Army Chemical Center, Maryland.

History: The Medical Division was activated in July 1943, and consisted of the Office of the Chief, Medical Division, in Washington, D.C.; the Medical Research Laboratory and the Toxicological Research Laboratory at Edgewood Arsenal (now Army Chemical Center); a toxicological research laboratory at Camp Siebert, Alabama; a medical research laboratory at Dugway Proving Ground, Utah; and a mobile field unit at Bushnell, Florida. At the end of the war all units, except the two laboratories at Edgewood Arsenal, were discontinued. These two laboratories were combined in September 1945 to form the present consolidated Medical Division.

Mission: The more specific functions of the Medical Division, carried on under the general supervision of the Chief, Medical Division, and of the Scientific Director, include:

(1) Toxicological research in the development and evaluation of chemical agents, munitions, and protective devices; and in the assessment of hazards to personnel and military animals from the use of chemical agents;

(2) Medical research in the field of chemical warfare, and in other fields especially assigned to the Chemical Corps, for the purpose of determining the most practicable prophylactic and therapeutic measures;

(3) Sanitary research in detection of chemical poisons in food and water, and methods of purification;

(4) Studies on mechanism of action of insecticides, insect repellents and attractants, rodenticides, and agents for control of animal parasites;

(5) Determination of prophylactic and therapeutic measures for treating men and animals exposed to poisoning by these agents, and investigation of health hazards of Chemical Corps personnel traceable to toxic agents;

(6) Experimentation necessary for assistance of the Medical and Ordnance Departments in the development and evaluation of missiles, and their physiological effects;

(7) Presentation of the results of Medical Division research to the Chief, Research and Engineering Division, Office of the Chief, Chemical Corps;

(8) Instruction to Medical, Veterinary, Medical Service, and Navy personnel in the medical, veterinary, and sanitary aspects of chemical warfare.

Command Relationship: Administratively directly under command of Commanding General, Army Chemical Center.

Facilities for Research: Laboratories and special equipment for research in toxicology, biophysics, pharamacology, biochemistry, entomology, pathology, physiology, sanitary chemistry, veterinary science, and analytical chemistry.

Special Equipment: In addition to the usual equipment found in research laboratories the Medical Division possesses gassing chambers, special equipment for studies of wound ballistics, biochemistry equipment for radioactive studies, constant temperature rooms, constant humidity rooms, electro encephalograph, treadmill, and special equipment for applied physiology.

Personnel: The present Medical Division, as of July 1949, consists of 38 officers, 20 enlisted personnel, and 208 civilian personnel. To this staff of 266 are added a corps of 14 consultants:

William H. Chambers, Ph.D., Washington University 1920 Physiology. Assistant Scientific Director and Chief, Toxicology Branch. Special interest: The physiology, biochemistry, and toxicology of chemical compounds.

David B. Dill, Ph.D., Stanford, 1925 Biochemistry and Physiology. Scientific Director. Special interest: Applied physiology.

Harold E. Himwich, M.D., Cornell, 1919 Medicine, Chief, Clinical Research Branch. Special interests: Correlation of brain metabolism and central nervous system function.

Carl M. Herget, Ph.D., Johns Hopkins, 1940 Physics, Chief, Biophysics Section. Special interest: Biophysics of body mechanisms.

Amedeo S. Marrazzi, M.D., N.Y.U. College of Medicine, 1928 Medicine (Physiology and Pharmacology). Chief, Toxicology Section. Special interest: Nerve impulse transmission and localization of drug action in nervous system.

Seymour D. Silver, Ph.D., Yale, 1932 Organic Chemistry. Chief, Bio-Analytical Branch. Special interest: Toxicology of inhaled compounds.

William H. Summerson, Ph.D., Cornell, 1937 Biochemistry. Chief, Biochemistry Section. Special interest: Metabolism of normal and cancer tissue and effect of drugs on isolated enzyme systems.

Leigh E. Chadwick, Ph.D., Harvard; 1939 Biology (Entomology). Chief, Entomology Section. Special interest: Insect physiology.

Stanley H. Durlacher, M.D., Yale, 1938 Medicine; M.S., Yale, 1941 Pathology. Chief, Pathology Section. Special interest: Pathology of the central nervous system.

Walter Fleischmann, M.D., University of Vienna, 1922 Medicine; Ph.D., University of Vienna, 1934 Zoology. Chief, Clinical Investigation Section. Special interest: Metabolism with special reference to endocrine and pharmacological effects.

Floyd A. Odell, Ph.D., Yale, 1940 Biology (Anatomy). Assistant Chief, Biophysics Section. Special interest: Biophysics (Wound Ballistics and Body Armor).

James H. Wills, Ph.D., Rochester, 1940 Physiology. Chief, Pharmacology Section. Special interest: The physiology and pharmacology of salivary glands.

Dietrich Bodenstien, University of Konigsberg, Germany, 1926-1928; Kaiser Wilhelm Institute, Berlin, 1928-1933, Biology. Entomology Section. Special interest: Experimental morphology of invertebrates and lower vertebrates, specifically developmental physiology and endocrinology of insects.

Francis N. Craig, Ph.D., Harvard, 1937 Physiology. Chief, Applied Physiology Section. Special interest: Metabolism.

Arthur J. Dziemian, Ph.D., Princeton, 1939 Physiology. Biophysics Section. Special interest: Burn and traumatic shock.

Joseph Epstein, M.S., Maryland, 1940 Chemistry. Chief, Sanitary Chemistry Section. Special interest: Reaction kinetics.

E. Ross Hart, Ph.D., California, 1940 Pharmacology. Toxicology Section. Special interest: Nerve impulse transmission.

Richard G. Horton, Ph.D., Cornell, 1937 Physiology. Assistant Chief, Toxicology Section. Special interest: The physiological and pharmacological effects of drugs on the nervous system.

Bernard J. Jandorf, Ph.D., Harvard, 1942 Biochemistry. Assistant Chief, Biochemistry Section. Special interest: Tissue metabolism and isolation and properties of enzymes.

Albert A. Kondritzer, Ph.D., Cincinnati, 1938 Biochemistry. Chief, Pharamaceutical Section. Special interest: Protein chemistry and structure.

Francis P. McGrath, M.S., Georgetown, 1938 Biochemistry. Chief, Gassing Section. Special interest: Inhalation toxicity and physiology of chemical compounds.

Bernard P. McNamara, Ph.D., Maryland, 1942 pharmacology. Pharmacology Section. Special interest: Mechanism of action of CW agents and methods of therapy.

Harry O. Michel, Ph.D., Duke, 1938 Biochemistry. Biochemistry Section. Special interest: Kinetics of enzymatic reactions.

John C. Seed, M.D., Harvard, 1945 Medicine. Chief, Aerosol Section. Special interest: Pharmacology of epinephrine blocking compounds and pulmonary absorption of aerosols.

Norwood K. Schaffer, Ph.D., Harvard, 1936 Biochemistry; M.D., Western Reserve, 1943 Medicine. Biochemistry Section. Special interest: Drug action, staphylocoagulase, oclampsia, anterior pituitary growth hormone.

Research Programs: Toxicological research in the development and evaluation of chemical agents, munitions, and protective devices, and in the assessment of hazards to personnel and military animals from the use of chemical agents.

Medical research in the field of chemical warfare for determination of prophylactic and therapeutic measures.

Sanitary research in detection of chemical poisons in food and water, and methods of purification.

Studies on mechanism of action of insecticides, insect repellents and attractants, rodenticides, and agents for control of animal parasites.

Prophylactic and therapeutic measures for treating men and animals exposed to these agents, and investigation of health hazards of personnel traceable to toxic agents.

Experimentation in the development and evaluation of missiles and their physiological effects.

Affiliation and Liaison With Other Agencies:

Ordnance Department
Quartermaster Corps
Navy
Atomic Energy Commission
Corps of Engineers
Medical Department
Army Air Force
Contractors: (as follows)
University of Virginia, - Dr. A. Chanutin
University of Chicago Toxicity Laboratory, - Dr. J. M. Coon
University of Illinois, - Dr. Warren S. McCulloch
Tufts College, - Dr. K. D. Reeder
The Johns Hopkins University, - Dr. O. P. Richtor, Dr. A. M. Harvey, and Dr. V. Dethier
Harvard University, - Dr. J. L. Whittenberger
National Opinion Research Center, - Dr. C. W. Hart
Duke University, - Dr. D. Wickens, Dr. J. A. Zapp, Dr. Wagnor-Jauregg, and Dr. H. J. Trunit

Fiscal Information: FY - 1950 ..... $ 1,167,000

1.2 The Army Medical Department Research and Graduate Schools.

Location: The Army Medical Center, Washington 12, D. C.

History: The Army Medical School was organized in 1892 by Surgeon General George M. Sternberg "to teach principles of scientific medicine" to recent graduates of medical schools as they came into the Army. The School was transferred to the building at the Army Medical Center in 1923 and was later joined by the Army Veterinary and the Army Dental Schools. In 1947 it was named The Army Medical Department Research and Graduate Schools.

Mission: To provide for the Medical Department a research and professional graduate training program and consultative service required for the Army's role in national defense.

Functions: (1) The planning, operation, supervision, and coordination of a research program for the Surgeon General of the Army to provide for the Medical Department's research and investigative requirements and to furnish through this program and other sources data and other teaching material and services required in function (2).

(2) The teaching of medical, dental, veterinary, and allied science professional technical data needed to provide an adequate medical, dental, and veterinary service for the Army in time of war. The instruction and training required for practice in war that are not developed or inadequately developed through normal civilian activities.

(3) The facilities for training and the results of research to be made available to other Federal services, the Organized Reserves, and to selected civilians.

(4) Pilot plant biological production where required.

(5) Consultative and special diagnostic service in clinical and laboratory sciences where required.

Command Relationship: The Commandant, Army Medical Department Research and Graduate Schools, is one of the component commands directly under the Commanding General, Army Medical Center, which, in turn, is directly under the Command of the Surgeon General, U. S. Army.

Facilities for Research:

(1) Floor Space:

Building 40 (South Wing) 55,711 Square Feet

	Square Feet	Per Cent
Laboratory	44,843.28	80
Office	4,033.72	7
Storage	2,016.86	4
Shops	1,040.96	2
Others	3,776.18	7

Building 40B (North Wing) - 55,911 Square Feet

	Square Feet	Per Cent
Laboratory	44,219.40	79
Office	2,351.16	4
Storage	3,687.15	7
Shops	2,612.40	5
Others	3,040.89	5

Building 83 (Animal Building) - 10,324.68 Square Feet

	Square Feet	Per Cent
Animals	8,775.98	85
Storage	1,548.70	15

(2) Types of Laboratories:

Bacteriology	Parasitology
Biochemistry	Radiobiology
Dental	Serology
Electronmicroscopy	Veterinary
Hematology	Virus and Rickettsial Diseases
Immunology	Basic Sciences

(3) Animals:

Types:

Agouti	Dogs	Hamsters
Canaries	Ducks	Mice
Cats	Ferrets	Monkeys
Cattle	Frogs	Rabbits
Chickens	Geese	Rats
Cotton Rats	Guinea Pigs	Sheep

Facilities: 160,000 animals were used in experiments during the past fiscal year. All guinea pigs and 40 per cent (about 70,000) of mice were bred in the animal house, losses being mostly from lack of temperature control. Facilities for handling animals in the experimental laboratories are available and are satisfactory except in extremely hot and humid weather.

(4) Shops: Maintenance and repair with a plumber, carpenter, mechanic, and 5 helpers.

Plans are under way for an instrument shop, a glass blowing shop, an electronics shop, and a machine shop where scientists can work or get work done. Job descriptions for an electronic engineer, an electronic mechanic, an instrument maker, and instrument maker assistant have been approved and authorization for the additional personnel has been requested.

Special Equipment:

Cages, metabolism, air tight, for isotope research
Chamber, low temperatures, low pressure
Electrodyne research stimulator
Electronic equipment, miscellaneous
Electron microscope, 50 KV
Electrophoresis, Tiselius
Freeze-dryers, large, 20 liter capacity, various types
Geiger counters, laboratory, with scalers
Geiger counters, survey meters
Oscillograph, recording
Oscilloscope, high intensity projection type
Potentiometers
Radioisotope handling apparatus
Respirometers, Warburg
Scopicon
Shadow casting chamber
Spectrograph, medium, quartz, Hilger
Spectrophotometers, infrared recording ultraviolet
Ultracentrifuge, air driven, Brams, concentration type
Ultracentrifuge, electric, Spinco, analytical type
Ultracentrifuge, Sharples
Ultrasonic transducer

Personnel:

Military	Authorized	Assigned
Officers	39	44 (includes trainees)
Enlisted Men	39	53
Civilian		
Full-time	175	186
Consultants	59	
German Scientist (biochemist)	1	

Background Information on Civilian Investigators.

Arthur Abrams, B.S., M.S. 1932 - City College of New York City, and M.S. 1934 Bellevue Medical School, New York City. Biology - Bacteriology. Bacteriologist (med). Chief, Diagnostic Antigen and Antisera Sect., Dept. of Biologic Products. Special interests: Chemistry, bacteriology, immunology, and serology.

Herbert C. Batson, B.S. 1932, M.S. 1934, South Dakota State College, Brookings, S.D., Ph.D. 1942, University of Minnesota. Chemistry-Bacteriology, Bacteriologist (med). Chief, Dept. of Biologic Products. Special interests: Biologic assay, biometrics, design of Immunological experiments.

Ross L. Gauld, M.D. 1924, Faculty of Medicine, University of Toronto, Canada; CPH 1935, Johns Hopkins University; Ph.D. 1936, Johns Hopkins University - Medicine,

Prev. Medicine, Medical Officer (Bact). Asst. Director, Dept. of Virus and Rickettsial Diseases. Special interests: Virus and Rickettsial Diseases.

Leo R. Goldbaum, B.S. 1934, Brooklyn College, New York, Chemistry, M.S. 1938, New York University, Toxicology, Ph.D. (except George Washington University, Washington, D.C., June 1950) Pharmacology, Chemist (Toxic). Chief, Toxicology Sect., Dept. of Chemistry and Physics. Special interests: Toxicology Pharmacology of Drugs.

Maurice Landy, B.A. 1934, M.A. 1934 and Ph.D. 1940, Ohio State University, Columbus, Ohio, Bacteriology, Immunology. Bacteriologist (Med). Asst. Director, Dept. of Biologic Products. Special interests: Bacterial nutrition, microbiological assay methodology. The nature of virulence, relationship of bacterial nutrition to antigenic composition.

Joseph E. Smadel, B.A. 1928, University of Pennsylvania, and M.D. 1931, Washington University of St. Louis, Missouri, Pre-Med., Medicine. Medical Officer, Chief, Dept. of Virus and Rickettsial Diseases. Special interests: Virus and Rickettsial Diseases.

Joel Warren, A.B. 1936 Yale University, M.A. 1938 Columbia University and Ph.D. 1940 Columbia University, New York City, Zoology and Bacteriology. Bacteriologist (med). Chief, Virus Research Sect., Dept. of Virus and Rickettsial Diseases. Special interests: Infectious diseases.

Research Programs: Clinical, laboratory, and field studies on new antibiotics.

Clinical and laboratory studies on blood substitutes.

Vital research studies on virus and rickettsial diseases.

Investigational work on radioactive isotopes.

Prevention and control of epizootics, bacillary dysentery and typhoid fever.

Rodent and ectoparasite surveys.

Residency training programs in the basic sciences and dentistry.

Development and improved methods of training, biological manufacture and advanced laboratory diagnostic techniques.

Affiliation and Liaison With Other Agencies:

(1) Research efforts have been undertaken jointly with the following institutions:

Armed Forces Institute of Pathology
Army Epidemiological Board
Atomic Energy Commission
Catholic University
Cleveland Clinic
Columbia University
Communicable Disease Center, U.S. Public Health Service

Duke University
Food and Drug Administration, Antibiotics Section
Georgetown University
Institute of Inter-American Affairs
Institute for Medical Research, Kuala Lumpur, Malaya
Jackson Laboratory, E. I. du Pont de Nemours and Company
Lankonau Hospital and Institute for Cancer Research
McArdle Laboratory, University of Wisconsin
Massachusetts Institute of Technology
Mayo Clinic
Member, Committee on Research Fellowships in Virology, National Foundation for Infantile Paralysis
Member, Committee on Virus Research and Epidemiology, National Foundation for Infantile Paralysis
Michigan Department of Health Laboratories
National Bureau of Standards
National Institutes of Health
Naval Medical Center
New York University
Ohio State University
Pan-American Sanitary Bureau
Patuxent Wild Life Research Laboratory, Dept. of Interior
Rockefeller Institute for Medical Research
Royal College of Surgeons
University of Chicago
University of Illinois
University of Maryland
University of Michigan
University of Minnesota
University of Montreal
University of North Carolina
University of Oklahoma
University of Pennsylvania
University of Southern California
University of Utah
University of Vermont
Vanderbilt University
Veterans Administration
Washington University
Yale University

(2) Extracurricular Activities of Staff:

Assistant Professor of Medicine, Georgetown University Medical School
Consultant, Division Biology and Medicine, Atomic Energy Commission
Consultant on Siphonaptera, Department of Agriculture
Consultant on Siphonaptera, U. S. National Museum
Consultant on Siphonaptera, U. S. Navy African Expedition
Director, Commission on Immunization, Army Epidemiological Board
Editorial Board, Journal of Immunology
Editorial Board, Proceedings of Society for Experimental Biology and Medicine
Member, Army Committee on Insect Control

Member, Committee on American Type Culture Collection, National Research Council
Member, Commission on Immunization, Army Epidemiological Board
Member, Committee on Research Fellowships in Virology, National Foundation for Infantile Paralysis
Member, Committee on Veterans Affairs, National Research Council
Member, Committee on Virus Research and Epidemiology, National Foundation for Infantile Paralysis
Member, Microbiology and Immunology, Study Section, Research Grants and Fellowships, U. S. Public Health Service
Member, National Board of Medical Examiners
Member, Subcommittee on Communicable Diseases of the American Public, Public Health Association
Members, Virus and Rickettsial Study Section of National Health Advisory Council

(3) Teaching for Other Institutions:

Lecturers for formal classes:

George Washington University
Naval Medical School
Ohio State University
University of Maryland, various schools

Students from other institutions:

University of Maryland

(4) Research with Foreign Governments: During the past year a research group worked with representatives of the Colonial Medical Research Committee of the United Kingdom, The Army Medical Department Research and Graduate School being given general credit in the official publication "Colonial Research."

Fiscal Information: FY 1950 . . . . . $ 314,915

1.3 Army Prosthetic Research Laboratory, Army Medical Center.

Location: Forest Glen, Maryland.

History: This laboratory was established by a directive from the Commanding General, Army Service Forces, on 4 September 1945, and operates as a coordinated part of the National Program of research and development on prosthetic devices.

Mission: To design, fabricate, and test artificial limbs.

Command Relationship: Under direction of the Medical Research and Development Board, Office Surgeon General, U.S. Army.

Facilities for Research:

Plant Area - 1.3 acres. Floor space - 10,335 square feet.

Office	-	1,684	square feet
Laboratory	-	4,300	" "
Shops	-	2,700	" "
Other	-	1,650	" "

Value

Land	-	$ 4,500
Buildings	-	75,000
Equipment	-	230,000

Facilities

Drafting Office
Welding Shop
Plastic Laboratories
Testing Laboratories
Machine Shop
Limb Shop
Technical Reference Library
Electroplating Room
Research Laboratories

Special Equipment:

The Machine Shop:

Sanders
Grinders
Saws (wood and metal) (band and circular)
Lathes (wood, metal and precision)
Milling machines
Drill presses
Polishers
The Plastic and Resin Laboratories
Mixers
Vibrators
Vacuum pumps
Ink mills
Records
Toledo scales
Shadowgraph scales
Ovens
Electric baths
Drying machines
Electronic power Generators
Hydraulic presses

Filter pumps
Induction furnaces and converters
Rotoclone bench
Viscosimeters

Testing Facilities:

Salt fog test cabinet
Inclined plane and vertical testers
Christian-Becker scales
Tukon Hardness tester
Sub-Zero test cabinet
Flashpoint tester
Stiffness tester
Taber-abraser tester
Chopping-Blacksmith, dies
Photometer strain indicator
Log testing machine
Glove slicing machine
Finger testing machine
Ankle tester
Baldwin-Southwart Universal tester

Personnel:

Military

Officers - 2
Enlisted Men - 6

Civilian - 24

Background Information on Civilian Investigators

Dr. Fred Leonard, B.S., University of Arkansas 1938, M.S. Polytechnic Institute, Brooklyn, N.Y. 1942, Ph.D. Polytechnic Institute, Brooklyn, N.Y. 1947, Official Title, Chief, Plastic Development and Testing Branch. Special interests: Organic, polymer and physical chemistry and physics.

Theodore J. Bushey, B.S., University of Vermont, 1935, Official Title, Technologist, Prosthetic Research.

Carl A. Neilson, George Washington University, 1933-1938. Official Title, Technologist, Plastics, Special interests: Chemistry and Mathematics.

Research Programs: This laboratory is concerned with research, development and testing of:

The Mechanical Hand
The Mechanical Hook
Cosmetic Glove
Metal Suction Socket Leg

and associated mechanisms and new materials for application to these prosthetic devices.

Affiliation and Liaison With Other Agencies:

National Research Council
Veterans Administration
Manufacturers

Fiscal Information: FY 1950 . . . . . $ 70,070

1.4 Climatic Research Laboratory.

Location: Pacific Mills, Lawrence, Massachusetts.

History: The laboratory was set up during the war, 19 January 1943, by a medical officer, Colonel Talbot. Its function during the war was predominantly the testing of quartermaster items of clothing and equipment.

Mission: To determine the protection requirements necessary to the proper functioning of military personnel wherever they are or conceivably may be stationed.

Command Relationship: The laboratory is a Class II Installation under command of a Quartermaster General and attached to the First Army for local administration and supply. Technical control is exercised directly by the Research and Development Branch, Military Planning Division, Office of the Quartermaster General.

Facilities and Equipment for Research:

Cold Chamber -- Temperature range from plus 70°F to minus 88°F.
Tropical Chamber -- Temperature range from plus 48°F to plus 128°F.
Three small constant temperature rooms -- Temperature range from plus 30°F to 110°F.
Physics Laboratory
Chemical Laboratory
Mobile Field Laboratory -- For evaluating physiological responses of soldiers and for conducting microclimatic and micrometeorological investigations in the field.
Instrument Shop
Technical Library
Lithographic reproduction shop
3 Treadmills
2 "Copper Men"

Personnel:

Military	Authorized	Present
Officers	10	9
Enlisted Men	47	47
Civilian	49	35

Background Information on Civilian Scientific Investigators:

Harwood S. Belding, A.B., Wesleyan, 1931, Biology (Physiology); M.A., Connecticut, 1935, Biology (Physiology); Ph.D., Stanford, 1938, Human Physiology and Biology; Laboratory Director. Special interest: Environmental stress physiology.

Francis E. Randall, A.B., Western Reserve, 1936, Biology; M.A., Western Reserve, 1938, Biology; Ph.D., Harvard, 1942, Anthropology; Head, Anthropology Unit. Special interest: Applied physical anthropology.

Alan H. Woodcock, A.B., Toronto (Canada), 1932; M.A., Toronto (Canada), 1933; Ph.D., Cambridge (England), 1937, Physics; Head, Biophysics and Instrumentation Unit; Special interest: Heat and Moisture Transfer; Arctic clothing principles.

Research Programs: Studies which indicate the type and amount of items of clothing and personal equipment required for the protection of troops stationed in any area of the world at any time of the year.

Studies which relate to investigations of body adjustments of man to his physical environment, with particular reference to the effects of temperature, humidity, wind, and radiation.

Studies to determine the principles which govern the design and use of clothing and other protective equipment requiring such military characteristics as coolness, warmth, freedom of movement, fit, and water repellency.

Laboratory testing of items developed by the Quartermaster Corps to determine their suitability, practicability, maneuverability, resistance qualities to the various environments, thermal insulation values, etc.

Affiliation and Liaison With Other Agencies: None

Fiscal Information: FY 1950 . . . . . $ 211,000

1.5 Medical Department Field Research Laboratory.

Location: Fort Knox, Kentucky.

History: The Medical Department Field Research Laboratory was established 1 September 1942, through the continued efforts of the Surgeon General, U. S. Army, the Surgeon of the Armored Forces, and the Committee on Industrial Hygiene of the National Research Council.

Mission: The primary mission, at the time of establishment, was to study the additional physical and mental stresses placed upon the soldier in the operation of armored vehicles with the objective of improving the comfort and provide additional safety measures to protect him in the performance of his military tasks.

The post-war mission of the laboratory is to provide, through research, scientific information on physiological and closely related problems that have military significance. Particular emphasis is at present being placed on problems of environmental physiology. The ultimate objective is to provide sound fundamental data that will eventually be of use in applied clinical research.

Command Relationship: The laboratory is a Class II Activity, directly under technical supervision of the Research and Development Board, Office of the Surgeon General, U. S. Army.

Facilities for Research:

Buildings:

Number of buildings - 19

Type of buildings:

Permanent	- 1
Temporary-wooden	- 18
Floor Space	- 66,800 square feet
Research	- 42,000 square feet
Shops, office, EM quarters and Administration	- 14,800 square feet
Value	- $ 1,050,000

Land:

12 acres, valued at $100 per acre

Service Provided:

Library. The library has 1,000 volumes and currently subscribes to 82 scientific and technical journals. Back issues of some journals for 5 to 10 years are on hand. The University of Louisville Medical School loans several hundred books and journals to the laboratory each month. The library is completely staffed.

Electronic Shop. Well equipped for construction, repair, and modification of electronic equipment and is adequately staffed.

Machine Shop. A small machine shop is well equipped with precision machinery.

Glass Shop. Completely equipped and operated by a trained glass blower.

Carpenter Shop. Well equipped, and with adequate personnel.

Paint Shop. Well equipped.

Instrument Shop. Completely equipped and operated by a trained German civilian instrument maker.

Photographic Shop. Photomicrographic, microfilm, and photostat service is furnished.

Special Equipment:

Large high temperature chamber (to 125°F)
Large low temperature chamber (to -70°F)
Ultra centrifuge
Flame photometers
Precision potentiometers
Infra-red recording spectrophotometer
Tiselius apparatus
Infra-red gas analyzers
Fatigue mills
X-ray equipment
Radioactive isotope scalers
Electrocardiographic machines
Vision and hearing test equipment
Machine Shop equipment
General Laboratory equipment

Personnel:

Military:

Officers	-	22
Enlisted	-	23
Civilian	-	46

Consultants - No regular consultants assigned. It is the policy of the Laboratory for the scientific personnel, when in need of consultation service, to select the qualified individual and make an appointment to visit him.

Background Information on Civilian Investigators.

Dr. R. G. Daggs, B.S. Bucknell 1926. Ph.D. Rochester, 1930. Official title, research director. Special interest: Physiology and nutrition.

Dr. D. E. Gregg, B.S. Colgate 1924. M.S. Rochester 1929. Ph.D. Rochester 1930. M.D. Rochester, 1940. Official title, research physician. Special interest: Physiology, cardiology.

H. Jensen, Ph.D., Gottingen, Germany 1921. Official title, Chief, biochemistry. Special interest: Biochemistry.

A. D. Keller, B.S. Utah College 1924. Ph.D. Cornell 1929. Official title, Chief, Physiology. Special interest: Physiology, pharmacology.

H. F. Kuppenheim, Ph.D., Heidelberg University, Germany 1922. Official title, Chief, Biophysics. Special interest: Biophysics, ultraviolet radiation.

R. W. Clarke, B.S. Wesleyan 1921. M.S. New York University, 1928, Ph.D. New York University 1934. Official title, Assistant Physiologist. Special interests: Physiology.

A. W. Carpenter. Official title, Chief, X-ray and photography. Special interests: X-ray, photography and archeology.

K. Schocken, Ph.D., University of Berlin 1928. Special interests: Biophysics, ultraviolet radiation, higher mathematics, statistics. Official title, Assistant Biophysics. German Scientist.

A. T. Krebs, Ph.D., Frankfurt University, Germany 1926. Official title, Assistant Biophysics. Special interests: Biophysics, radiobiology, mathematics.

Research Programs: Studies on the effects of cold and hot environments upon the soldier in the performance of his military tasks; the development of new research "tools" for furthering studies on cold injuries, shock, metabolism, fatigue, nerve injuries, X-ray diagnosis, heart disease and kidney functions.

Affiliation and Liaison With Other Agencies: The following hold nominal appointments as professional associates on the staff of the University of Louisville School of Medicine:

Dr. R. G. Daggs
Dr. E. A. Blair
Dr. R. W. Clarke
Dr. D. E. Gregg
Dr. A. D. Keller
Dr. H. F. Jensen

The laboratory assists the Army Field Forces Board No. 2 on testing problems involving the laboratory cold room and/or physiological principles. These activities are not listed as laboratory projects.

Several members of the staff serve as Army representatives on Research and Development Board Panels and National Institutes of Health Study Groups.

Fiscal Information: FY 1950 . . . . . $ 628,391

1.6 Medical Nutrition Laboratory.

Location: 1849 West Pershing Road, Chicago, Illinois

History: The Medical Nutrition Laboratory really had its start in 1917-1918 in the Nutrition Division of the Office of the Surgeon General, and the results of World War I research in Army feeding were summarized in a series of papers published in the American Journal of Physiology in 1921 and 1922. Between the wars, Medical Department research on Army nutrition decreased to a laboratory on paper, until active work on a small scale was started in the Division of Nutrition, Army Medical School, Army Medical Center, Washington, D.C. in early 1942. In September 1944 the Laboratory was moved to Chicago in order to be near the big food industries and the Quartermaster Subsistence Research and Development Laboratory. Administration of the Medical Nutrition Laboratory was radically altered in October 1946 as a result of an almost complete change in military personnel.

Mission: Under Army regulation (nutrition) it has three missions: (1) to investigate the health of troops in all environments to make sure that they are well fed, as healthy and as fit as is compatible with local danger, disease, and environment, (2) to prevent and to treat disease and damage insofar as is possible by nutritional and metabolic means, and (3) to be in a position to observe and make recommendations on the nutrition and health of civil populations under military control.

Command Relationship: The laboratory is directly under supervision of the Research and Development Division of the Office of the Surgeon General, U.S. Army, and is a Class II installation.

Facilities for Research: The laboratory occupies a section of the Quartermaster Food and Container Institute, with floor space of 43,252 square feet. Equipment has a value of $80,000.

Special Equipment:

General biochemical laboratory equipment
Calorimeters
Spectrophotometers
Erythrocythometers
Ph meters
X-ray equipment
Electrocardiographic equipment
Cardiotachometer
Electroencephalograph
Microscopes
Centrifuges
Tissue processer
Electrolytic analyzers
Microtome equipment
Incubators
Autoclaves
Ergograph
Tensiometer
Electrohemanometer
Water-type BMR machines
Isotope equipment
Shop equipment

Personnel:

Military	Authorized	Present
Officer	21	16
Enlisted Men	12	14
Women's Medical Service Corps	1	1
Civilian		
Graded		32
Ungraded		3

Background Information on Civilian Scientific Investigators

Dr. Robert M. Kark. B.A., University of Capetown 1931, L.R.C.P., M.R.C.S. Medical Scool, Guys Hospital, London 1935, M.R.C.P. London, 1937; Dip. Child Health, London, 1937. Official title, Assistant Director, Nutritional Research. Special interests: Clinical investigation, gastro-enterology, nutrition, metabolism, and haemotology.

Dr. Stanley M. Levenson. A.B., Harvard, 1937. M.D., Harvard 1941. Official title, Surgical Scientist, radiobiologist. Special interests: The clinical, biochemical, physiological, and pathological derangements, with particular emphasis on thermal and radiation injury and application of radioactive and stable isotopic techniques to study of various metabolic problems.

Dr. Conrad L. Pirani. M.D., University of Milan, Italy, 1935. Official title, Human pathologist. Special interests: Pathology of nutritional diseases and pathology and pathogenesis of connective tissue disease (theumatic fever and rheumatoid arthritis).

Dr. Frederick Sargent. B.S., Massachusetts Institute of Technology, 1942. M.D., Boston University, 1947. Official title, Medical Officer (metabolism). Special interest: Environmental physiology and medicine - theoretical and practical significance of seasonal variations as related to broad problems of constitution and disease, and nutritional chemistry.

Research Programs: Research is being done on the following subjects: Techniques for nutrition surveys of large populations, physical efficiency in relation to diet, symptoms of deficiency disease, methods for protein reinforcement of therapeutic diets, clinical investigation of nutritional and metabolic problems in health and disease, nutrition survey of troops engaged in varied activities, acclimatization to the cold in relation to vitamin "C" metabolism and endocrines, and survival ration in cold. Studies on the following subjects were recently authorized: Capacitron irradiation on materials of biological importance, catabolic reaction to injury; connective tissue in different metabolic and nutritional conditions; relation of nutrition and anemia to wound healing; infused red cells as source of protein in man; effect of radiation injury in animal and man; irreversible shock; and rehabilitation of patients with diseases of military importance.

Affiliation and Liaison With Other Agencies:

LaRabida Hospital
Bridewell House of Correction
Fitzsimons General Hospital

Fiscal Information: FY 1950 . . . . . $ 243,520

1.7 Surgical Research Unit.

Location: Brooke Army Medical Center
Fort Sam Houston, Texas

History: In August 1945 the Surgical Research Unit was established by the Surgeon General at Halloran General Hospital, Staten Island, New York, to conduct studies in traumatic surgery. An early project was the study of streptomycin. In December 1946 the unit was moved to Brooke General Hospital.

Mission: Research on treatment of established surgical infections, blood and blood substitutes, development of new antibiotics and their surgical application, resuscitation, development of surgical techniques and methods for field surgery and surgical treatment of casualties complicated by radiation burns.

Command Relationship: The unit is a component of Brooke Army Medical Center, a Class II installation under the direct command of the Surgeon General.

Facilities for Research and Special Equipment:

Floor Space:

Laboratory	-	3000 square feet
Hospital Ward	-	2000 square feet
Office	-	600 square feet

The laboratory is located in Brooke General Hospital in the Surgical Section.

Facilities as follows: Laboratory, clinical surgery, surgical ward, septic surgery clinic, special treatment rooms, animal research laboratory.

Apparatus for study of problems requiring biochemistry, radioactive isotopes, tissue pathology, tissue culture, physiology, bacteriology, immunology, and experimental animal surgery. There are available the laboratory instruments necessary to study and evaluate and to perform research leading to improved surgical operative procedures as practical in wartime. Clinical material is available at Brooke General Hospital.

Personnel:

Military	Authorized	Present
Officers	7	6
Nurses	4	4
Enlisted Men	13	12
Civilians	11	9

Research Programs: This unit is responsible for the study, research and development of problems relating to the practice of surgery, particularly as it is practiced under the techniques and systems peculiar to large numbers of wartime casualties. Current

studies include the detailed use of antibiotic substances as they may be used under field conditions to reduce the incidence of wound infections and promote the more rapid recovery of the patient, and underlying basic problems.

Affiliation and Liaison With Other Agencies: None.

Fiscal Information: FY 1950 ..... $ 82,495

1.8 Tuberculosis Research Laboratory, Fitzsimmons General Hospital.

Location: Denver, Colorado.

History: Established 1 October 1947.

Mission: To conduct studies on antibiotic therapy of tuberculosis; on the nutrition of chronic tuberculosis, and the follow-up of chest surgery in tuberculosis.

Command Relationship: This facility is directly under the supervision of the Coordinator, Research and Development Board, Fitzsimons General Hospital, and indirectly is under the supervision of the Research and Development Division, Office of the Surgeon General, U.S.A.

Facilities for Research:

A two-story ward building of permanent construction.
Laboratory, 3,468 square feet, includes biochemistry complete.
Administration, 1,734 square feet
Research Ward, 6,935 square feet (53 beds), making a total of 12,137 square feet.

Special Equipment: The laboratory is equipped to do all normal biochemical procedures. In addition there are the following items of equipment:

Beckman spectrophotometer with flame attachment, ultraviolet attachment, and fluorescence attachment
Monocular microscopes
Binocular microscopes
Refractometers
Potentiometers
Calorimeters
Analytical balances
Centrifuges
Autoclaves
Kjeldahl digestion apparatus

Personnel

Military	Authorized	Present
Officers	4	1
Enlisted Men	17	12
Nurses	3	0
Civilians	19	18
Consultant		
Civilian	1 (University of Colorado)	

Research Programs:

(1) Vitamin "A" in bronchiectasis. Purpose: To determine if there is any abnormality of vitamin "A" metabolism and if therapy with massive doses of vitamin "A" influence the course of bronchiectasis.

(2) Clinical study of bronchiectasis. A study of cases treated at Fitzsimons General Hospital during the 6 year period, 1 January 1941 to 31 December 1946.

(3) Low sodium diets in treatment of hypertension.

(4) The use of nitrogen mustard in the treatment of neoplastic disease.

(5) Para-amino salicyclic acid and promizole in treatment of tuberculosis.

(6) Streptomycin in the treatment of tuberculosis.

(7) Evaluation of experience in the use of extrapleural thoracoplasty in the treatment of tuberculosis as carried out at the Fitzsimons General Hospital from 1 January 1937 through 31 December 1946.

(8) Effect of lobectomy on blood volume.

(9) The status of adrenal cortical function in tuberculosis.

(10) Diethylthiuramidisulphide (antibuse) in the treatment of chronic alcoholism.

(11) Evaluation and testing of dental and medical items of equipment.

Affiliation and Liaison With Other Agencies: Informal affiliation with the University of Colorado.

The Hospital has a consultant arrangement with the faculty of the University of Colorado, and the services of these individuals are available to the Tuberculosis Research Unit.

Fiscal Information: . . . . . $ 56,380

2.1 Aero Medical Equipment Laboratory.

Location: U.S. Naval Base Station, Philadelphia, Pennsylvania.

History: The Aero Medical Equipment Laboratory was established in 1943 under the U.S. Naval Air Experimental Station, which is a command of the Naval Air Material Center, also established in July 1943.

Mission: The purpose of this laboratory is to conduct applied research in the field of aviation medicine, make engineering tests, and operational evaluation of equipment necessary to maintain aviation personnel at extreme altitudes and temperatures, and high acceleration.

Command Relationship: The Aero Medical Equipment Laboratory is a division of the Naval Air Experimental Station, of the Naval Air Material Center, which is under the military and coordination control of the Commandant of the Fourth Naval District and under the management and technical control of the Bureau of Aeronautics. The Aero Medical Equipment Laboratory is under the direction of the Director, Naval Air Experimental Station, the complete work load of which is assigned by the Commander, Naval Air Material Center, who is directed by the Chief of the Bureau of Aeronautics. All work done for and with other Government agencies is directed or approved by the Bureau of Aeronautics. The Bureau of Medicine and Surgery is cognizant of all physiological research and is in a position to effect the necessary integration and coordination of the research programs.

Facilities for Research:

Main Building

Oxygen Equipment Laboratory
Physiology Laboratory
Biochemistry Laboratory
Medical Specialties Laboratory
Electronic Laboratory
Clothing Laboratory
Optics and Illumination Laboratory
Machine Shop

Animal House

Special Equipment

(1) Altitude Chamber (Cylindrical)
Size: Compartment 1 - 30' long x 10' diam.
Compartment 2 - 10' long x 10' diam.
Compartment 3 - 10' long x 10' diam.
Range: -Alt. - 90,000
Temp. - 85°F.

(2) Altitude Chamber (Rectangular)
Size: Main Chamber - 11 1/2 x 9 1/2 x 6 1/2 high -
Lock 9 1/2 x 4 1/4 x 7 1/4 high
Range: -Alt. - 70,000
Temp. - 55°F.

(3) All Weather Room
Size: 22' x 23' x 16' high
Range: -Automatic cycling from - 35°F to 180°F with relative humidities from 0 to 100%.
Special Features:
Rain, Infra Red, Ultra Violet and can be used for immersion.

(4) Cold Room
Size: 18' x 24' x 19'
Range: -Ambient to -90°F.
Special Features:
Can be partitioned to three sections, each with automatic controls.

(5) Ejection Seat Test Tower
Range: - 110' track
Special Features:
Can be modified to test all types of seats, catapults and rockets.

(6) Optics and Illumination Dark Room
Size: - 95' x 20' feet

Special Features:

(a) Central control panel for remote control of all lighting.
(b) Two link trainers for observations.
(c) Planetarium and screen.
(d) Special cockpit lighting mock-ups.
(e) Lighting intensities from daylight to red dark adaptation levels.

(7) High Speed Catapult
Size: 500' long x 35' maximum width
Total Travel: 9' power stroke - 20' free run - 386' deceleration
Maximum Acceleration: 64 "g"
Maximum Deceleration: 3 "g"

Personnel:

Military

Officers -	5
Enlisted -	10

Civilians

Graded -	38
German Scientists	3

Background Information on Civilian Scientific Investigators.

Lawrence W. Meakin, B.S. I.E. 1932 Head Engineer. Special Interest: Aviation medical equipment.

Emanuel S. Mendelson, B.A. 1932, U. of Penn., Premedical and medical sciences. Head, Human Engineering Division. Special interest: Aviation physiology.

Rudolf Thauer, M.D., Frankfurt, Germany 1932, physiologist. Human Engineering Division. Special interest: Temperature control.

Hermann Schwan, Ph.D, Frankfurt, Germany 1940, biophysicist. Human Engineering Division. Special interest: Electrical properties of tissue.

Research Program: The laboratories at this Center are concerned with research and development concerning aeronautical material. The Aero Medical Equipment Laboratory conducts basic and applied research in the field of aviation medicine and conducts basic and applied research in the field of aviation medicine and conducts development, engineering tests, and operational evaluation of equipment necessary to maintain aviation personnel at extreme altitudes, temperatures, humidities, and high accelerations. The program carried on by the laboratory includes (1) research to determine the tolerance of personnel to low barometric pressures, extreme temperatures, high acceleration, physiological and psychological aspects of visions, noxious gases; and (2) development engineering test, and operational evaluation of oxygen equipment, acceleration protective devices, emergency rescue gear, stratosphere suits, cabin conditioning equipment and flight clothing.

The Laboratory consists of (1) the Human Engineering Division which includes the Physiology Section, the Acceleration Section and the Vision Section; (2) the Development Division which includes the Personnel Equipment Section, the Environment Section and the Protective Clothing Section; and (3) a shop. The Laboratory is equipped to conduct research and development of acceleration protective devices, optics and illumination equipment, oxygen equipment, emergency escape gear, flight clothing, etc.

Affiliation and Liaison With Other Agencies:

(1) Other Government Agencies

This laboratory is a part of the Naval Air Experimental Station and being immediately contiguous to the Naval Aircraft Factory has supporting facilities in development, test and manufacture of almost any conceivable item within the sphere of aviation-medical equipment development. Typical examples of such support are those afforded by the Plastics, Rubber, Structural Test, Engine (jet) and Instrument Laboratories, together with the assistance afforded in control of testing and preparation of reports by the Photographic Laboratory. All AMEL flight tests are conducted through the facilities of the NAES Flight Test Unit. The Naval Aircraft Factory is able to provide such functions as the modification of aircraft for special lighting, seat ejection and the actual construction of such typical items as an ejectable seat. The Frankford Arsenal and the Bureau of Ordnance work very closely with AMEL in the development of catapult charges and firing tests on the seat ejection program. The Franklin Institute has until recently afforded space for the Vision and Lighting Laboratory and continues in a consultative capacity on many scientific problems.

(2) Universities

The University of Pennsylvania, especially in the field of physiology and physiological optics, has worked in close collaboration with AMEL and a contract has just been arranged for neuropathological studies on primates under exposure to the vibrations of jet engines. Princeton University is collaborating with AMEL on animal studies in connection with the possible hazards in connection with engine test cells.

Fiscal Information: FY 1950 . . . . . $ 30,000

2.2 Artificial Limb Department - U. S. Naval Hospital.

Location: Mare Island Naval Shipyard - adjacent to Vallejo, California, 35 miles north of San Francisco, in the San Francisco Bay Area.

History: Shortly after Pearl Harbor, amputees began arriving at this hospital. The need was realized for an amputation center to rehabilitate war casualties, as well as the necessity of bringing together the patient, the physician, the limb fitter and the rehabilitation specialist as a more effective way of doing the job.

In 1943 the Surgeon General designated the U. S. Naval Hospital, Mare Island, Vallejo, Cal., as an amputation center. This was the first such department to be set up and placed in operation on a comprehensive scale in the Armed Forces.

In July 1945, the present quarters were completed and occupied, a plant specifically planned and constructed for the manufacture and fitting of artificial limbs, allied prosthetic devices, and for prosthetic research and development.

To November 1948, 2,200 amputees were processed through this Center. The maximum amputee census in 1945 was over 1,800 patients, and during that year the Artificial Limb Department produced over 600 artificial limbs, in addition to over 500 orthopedic braces. Numerous deviations from the then accepted methods of making and fitting prosthetic devices were made.

A close liaison is maintained with the University of California, Department of Engineering, at Berkeley and Los Angeles.

Mission: Conduct research and development of artificial limbs and orthopedic appliances in liaison with the Committee on Artificial Limbs of the National Research Council, with the University of California, Department of Engineering at both Berkeley and Los Angeles, and the Veterans Administration.

Manufacture artificial limbs and appliances for Veterans Administration in-patients and out-patients, and train these patients in the proper use of the artificial limbs and appliances.

Command Relationship: The laboratory is under the command of the Medical Officer in command of the Hospital.

Facilities for Research: The facilities of this laboratory consist of the following:

(1) Woodworking Section. Shapes knee, ankle and foot blocks to order, fabricates above-knee blocks for Above Knee Leg Section. Makes special patterns and constructions on order for other sections. Inspects and maintains adequate supplies of proper woods and other materials.

(2) Machine Shop. In addition to routine manufacture of metal parts of artificial limbs and braces such as ankle cables, hinges, brakes and units, this department makes variations of these to order, makes dies, jigs and other mechanical devices of numerous types used in research and development investigations of artificial limbs and prosthetic devices.

(3) Brace Section. Makes sketches, patterns and measurements of patients, then shapes materials to fit. Following final fitting, covers or otherwise makes braces cosmetically acceptable. All types of head, neck, arm, leg and back braces are made and fitted.

(4) Above Knee Leg Section. Suitable above-knee blocks are secured from the Woodworking Section and are shaped by hand to fit the stump of the individual patient - a highly specialized art. The finished socket is secured to the previously manufactured set-up of the knee, shin and foot. After fitting and aligning, the prosthesis is turned over to the walking instructor for beginning walking instruction. All manner of changes are made in the prosthesis as needed during the walking training period.

(5) Below Knee Leg Section. Plastic sockets fabricated in the Casting Section are fitted to the patient, and to the plastic shin. The hinges and lacer are fitted and the entire prosthesis is leveled and aligned. On satisfactory fitting, the prosthesis is turned over to the walking instructor for beginning walking instruction.

(6) Casting Section. Plaster reproductions of desired stumps, body sections and extremities are made showing very accurately necessary anatomical configurations for the manufacture of artificial limbs, orthopedic braces, special shoe prescriptions and partial hands. Below-knee plastic sockets undergo preliminary fitting around casts prior to delivery to Below Knee Leg Section.

(7) Artificial Hand Section. The articulated hand is made and fabricated in this section. At the present time each part is individually made by hand, but in the near future it is believed that development and field studies of existing models in use will be of sufficient value to allow the making of dies for quantity production.

(8) Plastics Section. In addition to the routine manufacture of plastic shins, plastic arm sockets and various other plastic sections, this division manufactures and colors the plastic gloves which serve as cosmetic coverings for the articulated hands. Each glove is highly individual and requires a high degree of artistic ability to manufacture. Non-functional partial hands and fingers are also made and again the critical reproduction of the proper matching texture, shape and color are of major importance.

(9) Foot and Shoe Section. Artificial feet are manufactured to fit shoes submitted by the individual patients, fitted with the steel ankle cable and equipped with the single rubber bumper of correct durometer for assembly to the proper plastic shin. All types of shoe prescriptions are filled in the Shoe Section.

(10) Artificial Arm Section. Manufactures and fits prosthesis for both above and below elbow amputations as well as for shoulder disarticulations. These include individual modifications of the harnessing arrangement, the Navy-Fitch principle of accomplishing elbow flexion and extension, the method of allowing supination-pronation and the method of fitting with the actuating cable in the most advantageous and simple way. New surgical approaches to the problem of operating prosthetic arms include the cineplastic operation. Extensive work is being accomplished using cineplastic motors at the present time.

(11) Finishing Section. On satisfactory completion of walking training and successfully passing the achievement test, each artificial limb is turned in to this section. All excess weight is removed, it is painted, covered with plastic or rawhide and otherwise is improved from the cosmetic viewpoint as much as possible.

(12) Stores Section. Depending upon the classification, sufficient materials are maintained in this section to last from six months to one year through a system of continuous inventory. Careful observation and controls are kept on purchases, stocks, and order points.

Special Equipment:

(1) Accelerated Walking Machine. A mechanical device whereby artificial limbs may be tested at an accelerated rate in which the motions, forces, stresses and weights, strains and torques actually occurring in prosthetic legs used by amputees may be duplicated. The equivalent of a year's wear may be duplicated in a few days through use of the machine.

(2) Muscle Force Tester. An electronic device designed and constructed for accurately, quickly and conveniently determining the exact forces possible for given muscle groups to exert. Flexibility of range of the machine extends from less than one ounce to one hundred pounds and is of useful value in evaluating the improvement or lack of improvement from day to day in diseased conditions.

(3) Machine for measuring torque and forces on artificial legs.

(4) A device for measuring the exact angles assumed by the ankle of an artificial leg in use by an amputee has been fabricated and is in use.

(5) A duplicating machine for reproducing large quantities of standard wooden parts rapidly is in the custody of this department.

Personnel:

Officers	- 2
Enlisted	- 9
Enlisted Students	- 6
Civilian	-15

Research Programs:

The relationship with the Committee on Artificial Limbs of the National Research Council is one in which the Committee coordinates the efforts of this department with those of other governmental agencies such as the Army, Air Forces and the Veterans Administration, for the common purpose of achieving research and developmental goals for the universal benefit. Extensive liaison is also maintained with civilian investigators, artificial limb shops and private and endowed organizations working on similar problems. Foreign organizations in England, Poland, Italy, Norway, Finland, Denmark, Canada, Mexico, Australia, New Zealand, and China have had representatives visit this facility and a considerable exchange of ideas and developments takes place.

Of major importance in the research program of this department is the method of making field studies and recording of the results. Since a large pool of amputees reside in the San Francisco Bay Area, many of them former patients of this Department, it appears that the location of this Center is more or less strategic.

A system of securing, classifying and recording data from former patients in the field has been originated, set up and is now in operation. The magnitude and, therefore, the value of this system is progressively growing more important. A complete method of cross-indexing a card system so that information on patients or on projects may be collected rapidly and accurately has been developed. The file hereby collected is believed to be the largest most comprehensive pool of information concerning research and development on artificial limbs and orthopedic braces in this country at this time.

Affiliation and Liaison With Other Agencies.

(1) Advisory Committee on Artificial Limbs of the National Research Council.

The artificial limb department maintains a close relationship with this Committee as an active partner, sends representatives to the formal and informal meetings, exchanges information regularly with participating members and furnishes members of the various policy making committees. Through the Committee, therefore, a close relationship is maintained with the Army, the Air Forces, the Veterans Administration, the Office of Vocational Rehabilitation, and the civilian limb industry.

(2) The University of California, Departments of Engineering, Berkeley and Los Angeles, who are contractors to the Advisory Committee on Artificial Limbs of the National Research Council.

(3) The Department of State is furnishing information for propaganda used for foreign dissemination.

Fiscal Information: FY 1950 . . . . . $ 22,000

2.3 Medical Field Research Laboratory.

Location: Camp LeJeune, North Carolina.

History: The Naval Medical Field Research Laboratory was founded in August 1943.

Mission: To perform all types of research, development and testing pertinent and peculiar to the practice of medicine in the field with the U. S. Marine Corps.

Command Relationship: This laboratory was organized under a medical officer in charge, responsible to the Surgeon General of the Navy and the Research Division of the Bureau of Medicine and Surgery, through the Commanding General, Camp LeJeune, North Carolina.

Facilities for Research: The following facilities are available for research:

Physics and Biophysics

Chemistry and Biochemistry.

Bacteriology and Parasitology

Physiology

Psychology

Personnel Selection
Sensory Perception

Field Preventive Medicine

Malaria Control
Field Sanitation and Epidemic Control
Rodent Control

Statistics (Supporting only)

Medical and Dental Equipment Testing and Development
(Development in rough prototypes only)

Field Clinical Research

Body Armor and Wound Ballistics

Personnel:

Military

Officer	- -	15
Navy Enlisted	- -	15
USMC Enlisted	- -	7
Civilians	-	31

Background Information on Civilian Investigators.

Ferdinand Heinmets, Biophysicist - Ph.D. University of Pennsylvania 1946. Biophysics. Head, Biophysics Department. Special interest: Electronmicroscopy, electrophoresis, spectroscopy.

Research Programs:

Materiel. Development and testing of and evaluating equipment, supply units, devices and clothing, principally from a medical point of view.

Personnel. Research and development of methods in which medical aspects are involved, to improve the selection of suitable personnel and to provide means of more effectively training them to accomplish their assignments.

Field Sanitation, Hygiene and Preventive Medicine. To constantly study, perform research and develop means of improving and maintaining the highest standards of sanitation in the areas of troop operation, hygiene amongst the personnel and, in close cooperation with the Division of Preventive Medicine of the Bureau of Medicine and Surgery, to further research and training methods in the fields of malariology and epidemic disease control.

Therapeutic Studies. To perform cooperative research in an attempt to improve therapeutic knowledge for the combating of disease.

Occupational Hazards. To study, perform research and develop items, devices, and methods of minimizing, insofar as is compatible with military requisites, the threats to the health and comfort of the personnel from occupational hazards presented in field operations.

Field Diets. To cooperate in studies aimed at the improvement of palatability as well as a balanced caloric provision of field diets.

Atomic Chemical and Bacterial Warfare. A coordination study of the advancements in atomic warfare with cooperation in development of prevention and treatment of ill effects likely to be suffered by troops in the field.

Fatigue. Exhaustive basic and cooperative studies to create a better understanding of the etiologies of fatigue and methods of combating them with projects along general lines.

Seasickness. Exhaustive basic and cooperative studies to create a better understanding of the etiologies of seasickness and methods of combating its ill effects, particularly insofar as it pertains to the involvement of troops in the amphibious phase of military operations.

Affiliation and Liaison With Other Agencies:

Duke University,
Durham, North Carolina

University of North Carolina,
Chapel Hill, North Carolina

North Carolina State College,
Raleigh, North Carolina

Fiscal Information: FY 1950 . . . . . $ 118,000

2.4 Naval Medical Research Institute.

Location: Bethesda, Maryland.

History: The Naval Medical Research Institute was established in 1942.

Mission: The mission of the Naval Medical Research Institute is to further medical and allied research for the purpose of improving naval practice in regard to protection of personnel versus injury, the prevention of disease, and the treatment of sick and injured. In conjunction with this mission, special consideration is given to the training of personnel in research methods and to the provision of opportunities for naval officers to participate in research.

Command Relationship: The Naval Medical Research Institute is under the management and technical control of the Bureau of Medicine and Surgery with a medical officer in command.

Facilities for Research: The Naval Medical Research Institute consists of facilities for research in the following scientific fields:

Bacteriology
Biochemistry
Biophysics
Chemistry
Dentistry
Hematology
Parasitology
Pathology
Pharmacology
Physiology
Psychology and Statistics
Radiology
Radioisotopes
Surgery
Virology
Atomic energy medicine
Aviation medicine and submarine medicine.

The physical plant includes:

7 Buildings - 90,270 square feet Floor Space

Special Equipment:

Aviation

Low pressure chamber
Chill chamber
Deceleration tower
Telemetering equipment with frequency modulation transmitters and testing devices
Standard Navy Link Trainer

Bacteriology

Lyophilizing apparatus
Spectrometer

Biochemistry

I.D.L.[1] scaler and counter tube
Tracerlab Autoscaler and Geiger-Muller tubes

Biophysics

Vibration machine for producing exposures of 2 - 50 cps
Ultrasound high intensity generator and measuring devices

Chemistry

Polarograph
X-ray diffraction apparatus
Electrophoresis equipment
Ultracentrifuge
Mass, infrared, and emission spectrographs

Dental

Hardness tester
Oral photographic apparatus

Electron Microscope

Two electron microscopes
Two high vacuum metal evaporators
High speed microtome

Hematology

Photographic equipment

Parasitology

Aviary (pigeons, canaries, chickens)
Insectaries (mosquitoes)
Snailarium

Pathology

Autotechnicon (tissue processor)
Photomicrographic equipment
Altman-Gersh freezing-drying equipment

[1]Instrument Development Laboratory, now called Nuclear Instrument and Chemical Corporation.

Physiology

Two psychrometric rooms
Gasimetric apparatus
Polarograph
Microrespirometers
Beckman and quartz spectrometers
Tissot's spirometers

Psychology and Statistics

Motion picture animal observation cage
Cage equipment for electrical recording of rat activity
Electroencephalograph

Radiology

200 KV X-ray generator in process of installation

Submarine and Diving Medicine

Pressure diving tank
Open diving tank
Divers' equipment
Gas mixing chamber
Recompression chambers

Virology

High speed refrigerated centrifuge
Lyophilizing apparatus

Personnel:

Military

Officers	34
Enlisted	105
Civilian	136

Background Information on Civilian Investigators.

Maynard Eicher - A.B. 1937 American University, Capitol Radio Eng. Inst. 1942, Instrumentation Laboratory. Medical Aspects of Utilization of Atomic Energy.

F. P. Ellinger - M.D. 1925 University Frankfurt, Germany, (Cum Laude), Atomic Energy, Medical Division, Hematological aspects, Pathology, changes, etc.

John P. Flynn - Ph.D. Columbia 1943, Psychology, Facilitation of Learning and Sleep Wakefulness Cycle.

Clay G. Huff - The Johns Hopkins University 1927 Sc.D., Parasitology, Life Cycles of Malarial parasites as related to Genetics and Immunity of the Hosts.

Edward A. Jerome - Columbia University, 1942 Ph.D., Psychology, Facilitation of Learning in Lower Animals and Man; Physiological factors in Sensitivity.

Manuel F. Morales - University of California, Ph.D. 1942, Physiology. Function and Structure of Muscle.

Julius Sendroy - Columbia University, Ph.D. 1926, Chemistry, Carbon Monoxide Chemistry and Physiology; gas and electrolyte balance of flood.

Levon A. Terzian - The Johns Hopkins University, Sc.D., Malariology, Biological behavior of mosquito, Disease Vectors.

E. P. Vollmer - The New York University, Ph.D. 1941, Physiology, Endocrine Factors in Resistance of Experimental Infection.

Kenneth S. Cole - Cornell, Ph.D. 1926, Biophysicist, Physical Studies on the Nerve Membrane.

Research Programs: Research undertaken at the Institute embraces such projects as the medical aspects of ionizing radiation, characteristics of the body that enable it to withstand high impact forces encountered in aviation, development of a vaccine for the prevention of scrub typhus, the biological effects of vibration, investigation of the causes and means of control of diarrheal diseases and dysenteries, dietary elements influencing dental caries, studies of the cerebral circulation by means of the lucite calvarium, studies of the sleep wakefulness cycles employing the technics of neurosurgery, facilitation of learning in lower animals and man, and the histopathologic effects of gas bubbles following rapid decompression from high pressure atmosphere and too high altitudes.

Fiscal Information: FY 1950 . . . . . $ 820,500

2.5 Physiological Test Section, Service Test Division, Naval Air Test Center.

Location: Patuxent River, Maryland.

History: This activity was established in 1944 by agreement between the Chief of the Bureau of Aeronautics and the Surgeon General.

Mission: The mission of the Physiological Test Section is to test, in the laboratory and in flight, equipment which is intended to minimize some of the hazards to personnel who are engaged in high altitude flight; to test equipment which is intended to protect aviation personnel from various toxic agents; to be available to the Naval Air Test Center and other Naval Aviation Activities as aeromedical consultants; to conduct such research as may be directed by the Bureau of Aeronautics and the Bureau of Medicine and Surgery; to conduct such indoctrination programs as the Naval Air Test Center may direct.

Command Relationships and Relations With Other Activities: The Physiological Test Section is organized under an officer-in-charge who is responsible to the Director of the Service Test Division of the Naval Air Test Center.

Facilities for Research: The facilities occupy approximately 2787 square feet of floor space.

Special Equipment: The physical set-up at the Naval Air Test Center, together with the aircraft available, which includes the newest types of Naval aircraft, present this activity with the broadest facilities for carrying out its assigned mission. The Physiological Test Section's Laboratory equipment consists of that which directly applies to aeromedical investigations. Also available upon request are the facilities of the various shops (instrument, electrical, etc.) of the Service Test Division. Some technical assistance is obtained from engineering personnel assigned to other test divisions of the Naval Air Test Center.

Personnel:

Military

Officers	-	3
Enlisted Men	-	5
Civilians	-	2

Research Programs: Physiological research is carried out under operating conditions. Equipment designed to protect aviation personnel or increase the efficiency of performance is tested in connection with the routine flight testing of new aircraft.

Affiliation and Liaison With Other Agencies: None.

Fiscal Information: FY 1950 $ 7,000

2.6 Naval Medical Research Unit 4.

Location: Great Lakes, Illinois.

History: Naval Medical Research Unit No. 4 was established 1 June 1946 at the U. S. Naval Hospital, Dublin, Georgia, for research on rheumatic fever. On 1 July 1948, the Unit was relocated at U. S. Naval Training Center, Great Lakes, Illinois.

Mission: The mission of the research unit is to develop effective means for the control of the acute communicable respiratory diseases among military personnel and to conduct studies into the etiology and pathogenesis of rheumatic fever with the objective of developing an effective prophylaxis for this disease.

Command Relationships and Relations With Other Activities: Naval Medical Research Unit No. 4 is established as an activity under the military control of the Commander, Naval Training Center, and the management control of the Bureau of Medicine and Surgery. The organization plan places the unit in the status of an activity under the Commanding Officer, Administrative Command, for administrative purposes, and under the direct control of the Bureau of Medicine and Surgery for logistics and research.

Facilities for Research: The Main Research Laboratory occupies approximately 725,200 square feet of floor space and a field research laboratory.

Special Equipment:

Refrigerated Centrifuge (International)
Flosdorf-Mudd Lyophile Apparatus
Sharples Supercentrifuge
Coleman Jr. Spectrophotometer
Tiselius Apparatus
Bacterial Ball Mill Grinder
Autotechnicon
Beckman Quartz Spectrophotometer
Warburg Apparatus
General Electric X-ray Equipment
General Electric Orthodiagraph Equipment
Cambridge "Research Model" Electrocardiograph
Cambridge "Simplitrol" Portable Electrocardiograph
Microphotographic Equipment

Personnel

Military

Officers	-	4
Enlisted Men	-	18
Civilian	-	12
Consultants	-	3

Background Information on Civilian Scientific Investigators.

H. Charles Mason, Ph.D., University of Illinois College of Medicine (Graduate School) 1939. Bacteriologist and Laboratory Director. Special interest: Virology and rickettsial diseases.

J. J. Robinson, M.D., Wisconsin 1936. Pathologist (Experimental Pathology).Special interests: Experiment pathology of streptococcal infections and rheumatic fever.

Research Programs: The research program formulated for Medical Research Unit No. 4 was designed to utilize to the fullest extent the unique opportunities presented for field research or respiratory diseases and rheumatic fever in the several populations available at the U. S. Naval Training Center, Great Lakes.

Affiliation and Liaison With Other Agencies: University of Chicago and Northwestern University.

Fiscal Information: FY 1950 . . . . . $ 134,500

2.7 Naval Radiological Defense Laboratory, Biological Division.

Location: San Francisco Naval Shipyard, San Francisco, California.

History: As a result of Operation "Crossroads" great emphasis was given to atomic research in the Navy. One of the first steps taken was establishment of this laboratory in November 1946 by several bureaus of the Navy with the general objective of finding means of minimizing the hazard and danger of nuclear radiation to human beings resulting from the use of atomic energy in warfare.

Mission: The primary objective is to study the medical aspects of radiological defense in atomic bomb and radiological warfare.

Command Relationship: The laboratory is under the administrative control of the Bureau of Ships. Other supporting bureaus are the Bureau of Medicine and Surgery, Bureau of Yards and Docks, Bureau of Aeronautics, and the Army Corps of Engineers, each of which has technical cognizance over portions of the program. The laboratory is under the shipyard command and for this reason obtains additional fiscal and financial support without direct charge to allotments and projects held by the laboratory.

Facilities for Research and Special Equipment: At present the Biology and Medical Divisions have ten laboratories that are adequately equipped for the work under way. Seven of these laboratories are for biological research and three are for medical service.

Personnel:

Military

Officers	-	12
Enlisted Men	-	7
Civilians	-	23

Background Information on Civilian Scientific Investigators.

Cecil Entenman, Ph.D., California 1940. Physiology. Assistant Chief, Biology Branch, Naval Radiological Defense Laboratory. Special interests: Radiotoxicology, metabolism, endocrinology.

Maurice C. Fishler, Ph.D., California 1943. Physiology. M.D., California 1947. Chief, Biology Branch, Naval Radiological Defense Laboratory. Special interests: Radiobiology, intermediary metabolism.

Francis R. Holden, Ph.D., Cincinnati 1934. Chemistry. Chief, Health Physics Branch, Naval Radiological Defense Laboratory. Special interests: Industrial hygiene, health physics.

Nathan E. Ballou, Ph.D., Chicago 1947. Chemistry. Leader, Basic Chemistry Group. Special interests: Chemistry of the fission products and the hazards therefrom.

Paul C. Tompkins, Ph.D., California 1941. Biochemistry. Staff Assistant to the Scientific Director. Special interests: Chemical and biochemical aspects of health physics.

Bernard Shacter, Ph.D., Michigan 1943. Biochemistry. Member, Metabolism Group (In Vitro). Special interests: Relationship between enzymes and steroid hormones.

Louis B. Werner, Ph.D., California 1948. Chemistry. Leader, Heavy Elements Group. Special interests: Health hazards due to and chemistry of transuranic elements.

Research Programs: The Biological-Medical Research Program at this laboratory is divided into five main categories of investigation:

(1) Studies of maximum permissible dosage of radiation, internal and external, under varying military situations.

(2) Internal radio-toxicity studies.

(3) Studies on the nature of radiation sickness.

(4) Medical studies and applications, including diagnostic and certain therapeutic investigations.

(5) Testing and developing radiological safety devices and procedures.

Affiliation and Liaison With Other Agencies: The Biology Medical Program is under the cognizance of the Atomic Defense Division of the Bureau of Medicine and Surgery as is the Atomic Research Section of the Naval Medical Research Institute at Bethesda, Maryland, and the programs of the two facilities are closely integrated. Through the Bureau of Medicine and Surgery liaison is maintained with other bureaus of the Navy, the Armed Forces Special Weapons Project and other armed services. A close relationship is maintained at all times with the Atomic Energy Commission. This close liaison with AEC and AEC installations allows access to restricted data materials and publications, as well as the advantages of close association with other installations of AEC and their scientists.

Both Stanford University and the University of California have made their libraries accessible to members of the Biology Division.

Fiscal Information: FY 1950 . . . . . (Confidential)

2.8 Naval School of Aviation Medicine and Research, Naval Air Training Command.

Location: Naval Air Station, Pensacola, Florida.

History: With the declaration of a national emergency by the President of the United States in 1939, there was an immediate demand for many naval flight surgeons fully qualified to fill billets in Naval Air Groups and aboard carriers. There was no longer time available to train them in an Army institution and then indoctrinate them in naval aviation. As a consequence, the Naval School of Aviation Medicine was organized and began formal instruction on 20 November 1939, at the Naval Air Station, Pensacola, Florida. The physical plant of the school has grown tremendously with the passing years.

From an inauspicious beginning in improvised spaces of the old dispensary, the school has grown to include five buildings of permanent brick construction housing very complete administration and teaching facilities, well equipped research laboratories and clinics. Unique features are three low pressure chambers, two of which are refrigerated, and the acceleration unit which includes a human centrifuge. The school also operates a night vision training unit and maintains an extensive survival training museum.

Formal research work began in July 1940 when a group of workers under Navy and NRC sponsorship began investigation on methods of pilot selection. In July 1942 the Physiological Section was recognized as a separate unit in the School of Aviation Medicine and many studies were carried out on respiration and high altitude physiology. In January 1943 the present research laboratory was opened and in July 1944 the acceleration unit was opened. By July 1945 research activities were carried on at a peak rate. At that time there were strong teams at work on (1) various phases of respiratory physiology, (2) selection and training of pilots, (3) pilot's disorientation, (4) visual and (5) acoustic problems, (6) high altitude investigation, (7) the effect of acceleration on the non-auditory labyrinth.

On 1 July 1940 research work was first begun and on 1 July 1945 three well equipped and fully staffed facilities were in operation. In addition to the facilities maintained and operated by the School of Aviation Medicine the clinical facilities of the Air Station Dispensary and the nearby Naval Hospital are available and are extensively used for teaching pruposes.

The course of instruction leading to the designation of Flight Surgeon includes twenty-six weeks of didactic instruction and approximately twelve weeks of indoctrinal flight training. Medical officers who complete only the didactic training are designated Aviation Medical Examiners. These individuals can qualify as Flight Surgeons after meeting certain requirements of satisfactory service and operational flying.

Approximately 1600 naval flight surgeons and aviation medical examiners have been graduated from the Naval School of Aviation Medicine since 1939, including more than 150 medical officers from foreigh countries.

The Naval School of Aviation Medicine trains enlisted personnel to serve as technical assistants to the flight surgeon. On completion of a four months' course of instruction these individuals qualify as aviation medical technicians.

Mission:

(1) To train selected medical officers in the speciality of aviation medicine, qualifying them for the designation of naval flight surgeon or naval medical examiner.

(2) To indoctrinate student flight surgeons in flight training so that they may, in their capacity of naval flight surgeons, have better understanding of the many physical and mental problems with which flying personnel are confronted.

(3) To train selected enlisted personnel as technical assistants for flight surgeons, qualifying them for the designation of aviation medical technicians.

(4) To prosecute research on approved research projects in the field of aviation medicine and allied fields.

(5) To familiarize student flight surgeons with the basic principles of research to the end that they may be alert to recognize and able to formulate new problems in the field.

(6) To provide additional post graduate instruction in aviation medicine as required.

(7) To train student naval aviators and their flight personnel in (1) physiological effects of altitude, (2) the use and maintenance of oxygen breathing equipment, (3) the use of survival and other protective equipment, and (4) the use of their eyes at night.

Command Relationship and Organization: By authority of a letter from the Secretary of the Navy,[2] the school was assigned as a unit of the Naval Air Training Command, under the military command of the Chief of Naval Air Training, and under the management control of the Bureau of Aeronautics.

The U. S. Naval School of Aviation Medicine and Research is an independent activity under an officer-in-charge. The school is divided into two main departments:

(1) Educational Department, which includes (1) School of Aviation Medicine and (2) School of Aviation Medical Technicians.

(2) Research Department. This department conducts research work on various problems in Aviation Medicine. Some of the work is carried out at the request of the Aviation Section of the Research Division of the Bureau of Medicine and Surgery, some at the request of the Bureau of Aeronautics, some projects are initiated at the request of the Chief of Naval Air Training and some locally. In addition to pursuing research work as such, every effort is made to encourage Medical Officers under instruction in the School to become "research minded" to the end that new problems arising in the fields may be recognized and referred for proper investigation.

Facilities for Research: Research activities are carried out mainly in buildings 625-D, 625-A, and 714. Building 625-D is a two-story building approximately 50' x 90' which houses the acoustics laboratories, the psychological laboratories and the physiological laboratories. Building 625-A is a one-story building which is approximately 244' long and 37' wide. About 1/3 of the space is devoted to garage facilities and the remainder

[2]Letter OP 24/jh, NA9/A31, Serial 462P24, 17 September 1948.

houses three low-pressure chamber units, which will be described in detail below. In addition, this building houses a general work shop devoted exclusively to the construction and modification of equipment used in the research laboratories. Building 714 houses the human centrifuge and related activities. The central portion is circular with a diameter of 47' with an adjoining one-story wing 135' long and 36' wide.

Additional facilities of the Naval reservation which are important to research activities with respect to the prosecution of clinical and laboratory studies are (1) the U. S. Naval Hospital with a capacity of 400 beds, (2) shop facilities for the construction of precision equipment in the Operations and Repair Department, (3) availability of aircraft including one SNJ-6 assigned to the laboratory, (4) the availability of flight students and instructors as subjects in various experiments, and (5) presence of a large number of flight students and Naval aviators which provide clinical material covering a wide range of experience in various clinical aspects of Aviation Medicine.

Special Equipment:

Acoustic Laboratory: An airplane interphone mock-up including standard Navy microphones, earphones, etc., for thirteen speakers and/or listeners. A noise generator and static generator capable of simulating the noise spectrum of most Navy planes, located in a partially sound absorbent room. By keeping all of the components of the system constant, save one, the effect of that component upon voice communication efficiency can be evaluated.

Phonograph recording equipment including several low fidelity disk and wire records, high fidelity tape recorders and a high fidelity disk recorder with the associated play-back units, microphones, amplifiers, etc.

Sound measuring and analyzing equipment:

(1) A high speed graphic level recorder designed to make a permanent continuous record of variation of intensities of any electrical signal on a linear, logarithmic or phon scale. The constant speed of the recording tape makes this instrument useful for measuring duration of utterances, reverberation time, etc.

(2) A sound level meter for measuring the amplitude of noise or speech.

(3) General radio sound analyzer working in conjunction with the sound level meter to do frequency analysis of noise and/or speech.

(4) An automatic octave sound analyzer and recorder suitable for analyzing and measuring sound in combat vehicles including airplanes.

(5) Two audiometers that are capable of indicating the hearing threshold of an individual.

(6) A small electrical work shop containing various standard meters and oscillograph, audio signal generator, etc.

Psychological Laboratory: A Link trainer housed in a twelve-sided light-proof room, the walls of which are covered with sound proofing material. The trainer is modified so that it can be rotated right or left in the horizontal plane at speeds up to 30 rpm. An intercommunication system allows the subject in the trainer to communicate with the

experimenter in an out-room. Equipment suitable for recording eye movements is installed in the trainer. A model plane attached to an arm, which is suspended from the ceiling, provides one form of fixation target.

Linear accelerometers recording in all three planes and suitable for mounting in an airplane have been specially constructed by the Hathaway Instrument Company. A comparable bank of angular accelerometers have been constructed and are now under test.

Collimated "Star" modified in various ways to provide adjustable fixation targets for experiments in disorientation.

Link trainer modified to measure judgments of tilt.

Witkin tilt room.

Hecht-Schlaer adaptometer.

Hecht-Schlaer adaptometer (modified).

Gristed choice-response device.

Fifteen Safe Flight Instrument Corporation stall warning indicators (for aircraft).

Spherical sound localization chamber.

Two wire recorders equipped for operation in airborne aircraft.

Acceleration Unit: Natural gas driven gasoline Chrysler engine with standard gear shift, transmission, differential. Single tire friction drive to a 22-ton flywheel. Superstructure with 20-foot radius clutches onto flywheel and is capable of about 12 G for ten seconds dropping to 8-9-10 G if held at maximum for 1 minute. Time to reach maximum acceleration after clutching in, increases with increase of acceleration desired, but averages about 3" for 3-5 G up to 7-8" for maximum (12) G. Mock-up airplane cockpit at end of arm permits study of effect of G, as simulating that developed in curved aerial flight, on man and on experimental animals.

Facilities are available for motion pictures during acceleration. Photographic recording devices of various physiological parameters such as ECG, respiration, ear opacity and visual stimuli responses may be obtained through the transmission of electrical impulses.

Altitude Training Unit:

Chamber 1 - nonrefrigerated; air conditioned; equipped for animal experimentation.

High altitude at which it will operate effectively, 35,000 feet.
Size of chamber: from bulkhead to bulkhead; length, 13 feet 6 inches, width, 7 feet 1 inch.
Floor space: length, 11 feet, width, 5 feet 3 inches.
Size of lock: floor space; length, 5 feet 4 inches, width, 5 feet 2 inches.

Chamber 2 - refrigerated

Seating capacity: 12 inch chamber and 3 inch lock.
High altitude at which it will operate effectively, 42,000 feet.
Size of chamber: from bulkhead to bulkhead; length, 14 feet 10-1/2 inches, width, 5 feet 11-1/2 inches.
Floor space: length, 13 feet 8-1/2 inches, width, 4 feet 11-1/2 inches.
Size of lock: floor space; length, 4 feet 4 inches, width, 5 feet 9-1/2 inches.

Chamber 3 - refrigerated

Seating capacity: 16 inch chamber and 4 inch lock.
High altitude at which it will operate effectively, 43,000 feet.
Size of chamber: length, 9 feet 6 inches, width, 11 feet 6 inches.
Size of lock: length, 9 feet 10 inches, width 4 feet 4 inches.

Chamber 1

Equipped with mobile cages for nine dogs.
Equipped with motor driven treadmill for small animals.

Chamber 3

(4) Automatic pressure breathing regulators are installed in chamber.
(1) Automatic pressure breathing regulator as spare for use in case of mechanical failure of one of the four which are installed.

Chambers 1 and 2 are equipped for continuous service.

Physiological Laboratory:

Van Slyke and Haldane apparatus for gas and blood gas analysis
Warburg apparatus
Beckman spectrophotometer
Nitrogen meter
Autoscalar
Radiation survey meter
Laboratory monitor
Interfacial tensiometer
Hydrophil balance
Pauling oxygen meter
Millikan oximeter with recorder
Micromanipulator
Densicron photometer
Ph meter
Refractometer
Conductivity bridge
Complete microchemical equipment
Motor driven treadmill
Electrocardiograph machines
Spirometers of various sizes
Fluoroscope

Personnel:

Military

Officers	-	13
Enlisted	-	31
Civilians	-	17

Background Information on Civilian Scientific Investigators.

J. L. Niven, Ph.D., Clark University, Worcester, Massachusetts, 1942 Psychology, research psychologist. Special interest: Vision and vestibular apparatus.

Dietrich E. Beischer, Ph.D., Stuttgart, Germany, 1932 Chemistry, research scientist, biochemical section. Special interest: Colloid chemistry.

Hermann Schaefer, Ph.D., Frankfurt, Germany, 1929 Biophysics, research scientist. Special interest: Radiation biophysics.

Research Programs:

Various phases of respiratory physiology.

Selection and training of pilots.

Pilots disorientation.

Visual and acoustic problems.

High altitude investigation.

The effect of acceleration on the nonauditory labyrinth.

Affiliation and Liaison With Other Agencies:

Tulane University, Department of Psychology

Ohio State University, Department of Speech

University of Pennsylvania, Graduate School of Medicine, Department of Biochemistry

Emory University, Department of Anatomy, Pathology, and Physiology

Florida State Department of Health

A very close relationship also exists with Dr. Paul D. White, of the Department of Cardiology at Massachusetts General Hospital, Boston, and Dr. Brant Clark, Professor of Psychology at San Jose State Teachers College in California.

Fiscal Information: FY 1950 . . . . . $ 87,000

2.9 U. S. Naval Medical Research Laboratory.

Location: U. S. Naval Submarine Base, New London, Connecticut.

History: On 23 February 1944, Medical Research formally became a separate department of the U. S. Submarine Base; however, it had been functioning as a separate unit of the Medical Department of the Base since 1941.

Mission: The mission of the Medical Research Laboratory is that of augmenting the efficiency and effectiveness of the submarine force by basic, applied, and developmental research, and application of findings in fields pertaining to the human factor.

Command Relationship: This laboratory works under the direct management and technical control of the Bureau of Medicine and Surgery (Research Division). However, it has conducted joint research projects with, or conducted projects for BuOrd, BuShips, and BuPers, and performed requested studies and field tests for these and other government bureaus and agencies. The Medical Research Laboratory is a subsidiary activity of the U. S. Naval Submarine Base, New London, Connecticut.

Facilities for Research and Special Equipment: The Sound Section of the Medical Research Laboratory has the following equipment available:

2 audiometers
2 beat frequency oscillators
1 oscillator with incremental frequency dial
1 thermal noise generator
1 propeller noise discrimination injector
1 wave analyzer
1 sound level meter

The Sound Section is equipped to do studies in pure tone discrimination on any variable - pitch, loudness, time, etc; studies of the effects of noise on discrimination; studies on auditory fatigue; standardization of any hearing test on normal or pathological subjects; construction and standardization of articulation tests; problems in selection of sonar men.

The Visual Section of the laboratory has the following equipment:

Photometers
Campimeters
Adaptometers (NDRC, Hecht-Schlaer, Radium Plaque)
Densimeter
Oculometer
Optometric Tests Set (corrected)
20 foot range with controlled illumination on target and surrounding area
Set of validated checkerboard targets subtending 1 minute arc at 7, 8, 10, 12, 14, 17, 20, 24,to 70 feet

The Submarine Escape Training Tank offers unique opportunity for validating selection tests, as well as for trial of escapes techniques and related safety equipment for

submarines. A high pressure recompression chamber 7 x 16 feet and tested to a working pressure of 100 pounds per square inch is included in the training tank equipment.

The availability of submarines, submarine tenders and rescue and salvage vessels at this Base makes field testing of equipment practicable.

Personnel:

Military

Officers	-	11
Enlisted	-	19
Civilians	-	22

Background Information on Civilian Scientific Investigators.

Forrest L. Dimmick, Ph.D., Cornell 1915. Psychology. Head, General Visual Research Facility, Research Executive. Special interests: Vision, night vision, and color vision.

J. Donald Harris, Ph.D., Rochester 1942. Psychology. Head, Sound Facility. Special interests: Audition, sound discrimination, cochlear response.

Research Programs:

Personnel selection (physical, psychological and physiological).

Studies concerned with operation of submarine equipment, directed toward improved techniques and control of equipment.

Research into basic senses to obtain improved effectiveness of the individual.

Studies of health and habitability aboard submarines for protection and comfort of the crew.

Affiliation and Liaison With Other Agencies: Harvard, Yale, Connecticut College, Massachusetts Institute of Technology, Tufts, Brown University, Wesleyan, and the Worchester Institute for Experimental Biology.

Fiscal Information: FY 1950 . . . . . $ 40,000

3.1 Aero Medical Laboratory.

Location: Wright-Patterson Air Force Base, Dayton, Ohio.

History: The Aero Medical Laboratory was first established in May 1935 as the Physiological Research Unit of the Equipment Laboratory, Experimental Engineering Section, Air Materiel Command. On 1 July 1942 the Laboratory was established as a permanent installation of the Engineering Division, Air Materiel Command, Wright Field. From the date of its inception, the Laboratory has been engaged solely in the field of research and development.

Mission: The mission of the Aero Medical Laboratory includes the following activities:

(1) To conduct research on the effect of flight on the human organism and to recommend methods for maintaining and improving the efficiency, health, and safety of flying personnel.

(2) To advise and collaborate with other laboratories on aero medical and related specialties for maintaining and advancing the health, safety, and efficiency of flying personnel.

(3) To develop, standardize and test (or to collaborate with other agencies in the development of) items of military aeronautical equipment as may be necessary in improving the efficiency, health, and safety of flying personnel.

(4) To develop, standardize, and test gas generation equipment.

Command Relationship: The Aero Medical Laboratory is under the direct administrative control of the Engineering Division of the Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio. Technical control of the over-all aero medical research program of the Laboratory is the responsibility of the Surgeon General of the Air Force.

Facilities for Research: Total Floor Space - 90,190 square feet. (Includes two permanent buildings and five temporary buildings).

Special Equipment:

Altitude Chamber: (16 man-low pressure)

Size: Inside dimension: Main chamber, 16' x 8' x 6' 6". Lock chamber 7' x 8' x 6' 6".

Seating capacity: 11 airplane-type seats. Chairs can be added to accommodate additional personnel.

Rate of ascent: Approximately 10,000'/min. to 40,000 ft.

Altitude Chamber: (Two - 2 man-low pressure)

Size: Inside dimension 6' x 5' 6" x 6' 6". Door 2' 4" x 5' 8". No lock chambers.

Seating capacity: Four people.

Rate of ascent: 6,000'/min. to 40,000 ft. This rate of ascent can be increased by using vacuum pump from the large chamber.

Use: These chambers used principally in testing of equipment of altitudes.

Altitude Chamber: (16 man-low temp-low pressure)

Size: Inside dimension, Main chamber, 14' 1" x 6' 5" x 6'. Lock chamber, 3' x 7' x 6'.

Rear door: The back of the chamber is completely removable in order to facilitate introduction of material which is too large to bring through the doors on the front.

Seating: Bench-type seats - accommodate about twelve people.

Rate of ascent: Approximately 8,000'/min. to 40,000 ft.

Temperatures: From room temperature to 67°F. in three hours. Can also be used at room temperature.

Use: This chamber is used for indoctrination purposes, as well as testing or equipment.

Altitude Chamber: (Gaurdite Stratosphere)

Size: Working space, 9 feet 10 inches long x 3 feet 9 inches wide x 8 feet high.

Temperature: Temperature range, plus 170°F. to 70°F. with a temperature deviation of plus 2°F. from the control point. Even better control is possible over long periods of operation at set temperature. After a precooling period, the temperature may be cooled from temperature to minus 60°F. in four minutes and warmed to room temperature from minus 60°F. in five minutes.

Altitude: Pressure altitude is measured by an aeroroid barometer and is controlled from ground level to 50,000 ft. with a deviation from control point of plus 200 ft. The chamber has a maximum climb rate of 7 to 8 thousand feet per minute to 20,000 feet decreasing to 4,000'/min. from 50 to 40 thousand feet. It is 50 to 25 thousand feet per min. from 40 to 20 thousand feet, decreasing to 5,000'/min. at ground level. Pressure altitude and temperature control may be coordinated by means of a time schedule controller. A flight may be started at a desired ground level temperature and the temperature is changed by means of this controller to a temperature value desired for any given altitude. The altitude may also be controlled manually. Also the chamber may be ventilated manually when on automatic control.

Centrifuge: Human Testing.

One - An electrically controlled and powered structure consisting of horizontal twin booms 48 feet in length. A free swing cab is supported between and at either end of the booms, 20 feet from the rotational axis. During rotation of the structure the cabs tilt outward to the near horizontal plane and positive radial acceleration (G, centrifugal force) is imposed upon an object in the cab.

Electronic control of the speed of rotation permits exceptionally rapid development of the radial acceleration, i.e., 3 G per second or greater, and the acceleration may be maintained or varied as desired. Maximum speed is 52 revolutions per minute which is a force of 21 positive G at the 20 foot cab station. Load limit of either cab is approximately 400 pounds net. Provision is made for remote photographic or ink recording of signals generated in the cab for supplying the cab with electrical power, either A.C. or D.C. Signals as low as 200 micro-volts from the cab can be amplified and satisfactorily recorded without interfering artefacts.

Motion picture or speed lamp still photography studies can be made.

The centrifuge is specially designed for physiological investigation, but is adaptable to testing or studying light-weight equipment during positive radial acceleration.

Horizontal Centrifuge:

An 8-foot horizontal centrifuge will be completed in June 1950. The subject may be placed on his side on the centrifuge so that the axis of rotation is at or near his center of gravity. This equipment will be installed in Building 33.

Vertical Centrifuge:

A vertical centrifuge will be completed in June 1950. On this device the subject will be seated in a chair and will be rotated head over heels. The axis of rotation can be varied around the center of gravity of the man. The energy for rotating the chair is stored in a large flywheel so that relatively high angular accelerations may be obtained.

Chamber: (All Weather)

Dimensions: Room 13 feet x 18 feet x 10 feet high.

Temperature: From 70°F. to minus 40°F. in about four hours.

Heating: Electric heating coils in an air recirculation system will heat room from 70°F. to 160°F. in two to three hours.

Control of: A Foxboro dry and wet bulb control holds.

Temperature and Humidity: Temperature to a plus 30°F. of settings.

Anechoic Room:

Size: Outside dimension 10 feet wide x 10 feet high x 27 feet long. Door 4 feet x 7 feet.

Wall and Ceiling: Covered inside with fibreglass sheets 1-1/2 feet thick plus fibreglass wedges 1 foot long and 8 inches wide. Floor also can be covered with removable fibreglass panels.

Facilities: Two observation windows 1-1/2 feet x 3 feet. A high-powered siren driven by 250 H.P. motor capable of generating intense sound to 200,000 cycles per second.

Use: To study effects of intense sound on animals and human beings.

Vibration Table:

Size: 3 feet wide x 3 feet high x 4-1/2 feet long.

Drive: 15 H.P. motor.

Operation: Metal plate 4 feet x 3 feet x 1-1/2 inches can be vibrated in three directions with variable amplitude in each direction up to frequency of 60 cycles per second. Load capacity 20 pounds.

Use: To study effects of mechanical vibration on human beings.

Deceleration Track:

Track: 2,000 feet long. Originally built for testing guided missiles.

Brake System: Much original pioneering work was necessary to design this important feature of the equipment. As now installed 45 feet of brake surface can bring 1500 pounds of weight to rest from a velocity of 200 miles per hour. In terms of "G" units a maximum of 50 plus 5 G can be controlled to any time minus G curve desired.

General: The equipment is capable of simulating crash landings or ditchings of aircraft. It is designed for use to determine the best position to assume, depending upon the space available and the aircrewman's duty.

Location: Muroc Air Force Base, Muroc, California.

Vertical Acceleration Tester:

Description: A seat is mounted on a track of two 30 pound railroad rails. This track extends to a height of 100 feet. The rails guide the travel of the ejection seat in experimental runs for determining the best obtainable time minus G acceleration curve from the catapult used for fighter aircraft. The stopping of the seat in its upward travel as well as upon its return to the starting point is by gravity. In the latter case seven safety devices utilizing three separate and distinct principles are employed.

The seat is instrumented to measure time versus acceleration at three points on the subject and at one on the chair. In addition, the velocity is measured at all stages of the ejection stroke and to a point several feet beyond.

The velocity is determined by the charge used in the gun and approximates a maximum of 60 feet per second and will not exceed 15 G in acceleration. The rate of change in acceleration approximates 150 G per second.

Additional Facilities of the Laboratory consist of the following shops:

Clothing, Instrument, Glass Blowing, Drafting, and Machine.

Personnel:

Research Workers:

Professional Officers	30
Professional Civil Service Employees	72
German Scientists	11
Total	113

Supporting Personnel:

Civil Service Employees	62
German Civilian Employees	6
Airmen (Enlisted)	10
Total	78
Grand Total	191

Consultants	12

Background Information on Civilian Scientific Investigators.

Fred W. Berner, Ph.D., Cornell University, Industrial Chemistry, 1933; Head, Engineering and Development Branch; Special interests: Oxygen equipment.

William C. Biel, Ph.D., Stanford University, Psychology, 1937; Asst. Chief, Psychology Branch; Special interest: Human Engineering.

Charles Castellano, BME, University of Florida, Mechanical Engineering, 1941; Head, Installations Unit; Special interest: Oxygen equipment.

Julien M. Christensen, B.S., University of Illinois, Research Psychology, 1940; Project Engineer, Psychology Branch; Special interest: Equipment design.

Henry C. Dyme, Ph.D., Iowa State College, Physiological Chemistry, 1939; Chief, Nutrition Unit; Special interest: Nutrition.

Donald R. Good, B.A., Lake Forest College, Physics, 1939; Head, Aircraft Equipment Unit; Special interest: Oxygen regulators.

Walter F. Grether, Ph.D., University of Wisconsin, Aviation Psychology, 1938; Chief, Psychology Branch; Special interest: Vision, legibility, and equipment design.

John W. Heim, Ph.D., Harvard University, Physiology, 1935; Chief, Physiology Branch; Special interest: Respiratory physiology.

James P. Henry, M.S.C., McGill, 1942; Experimental Medicine, MC, Cambridge (equivalent to M.D.) 1938; Chief, Acceleration Unit; Special interest: Environmental (space physiology) and experimental medicine.

Donald B. Huxley, Chief, Clothing Branch; Special interest: Design and development of specialized flight and occupational clothing.

Miles A. McLennan, B.S.E.E., University of Michigan, Electrical Engineering, 1928; Chief, Physics Unit; Special interest: Instrumentation in physiological research.

Horace O. Parrack, Ph.D., Columbia University, Human physiology, 1940; Chief, Bio-Acoustic Unit; Special interest: Physiological and psychological aspects of sound and vibration.

Harvey B. Savely, B.S., Mississippi State College, Zoology, 1934; Ph.D., Duke University, Ecology, Physiology, 1939; Chief, Special Projects Unit; Special interest: Effects of accelerations of short duration on human body.

Harold L. Strong, Climatic Test Specialist; Special interest: Design and development engineer rescue and survival equipment.

Melvin J. Warrick, M.S., University of Illinois, Research Psychology, Aviation, 1939; Project Engineer, Psychology Branch; Special interest: Equipment design, visual-motor coordination.

John W. Wilson, Ph.D., Duke University, Physiology, 1938; Chief, Respiration Unit; Special interest: Respiratory physiology.

Research Programs: The Laboratory is divided into six branches devoted exclusively to research and development. These branches are charged with specific duties and responsibilities through which their technical functions are planned, organized, directed and coordinated through the office of aeromedical operations. The program of these six research and development branches are outlined as follows:

Engineering and Development Branch:

(1) Design, develop, test, and release for standardization all oxygen equipment for aircraft, for flying personnel, for ground servicing and field testing.

(2) Conduct research, development, and release for standardization equipment for the generation of oxygen, carbon dioxide, and nitrogen.

(3) Develop and standardize all carbon dioxide cylinders and valves, as well as inflation gear required for sea rescue equipment and its ground servicing.

(4) Test and appraise respirators and other protective devices against toxic gases and dust particles.

(5) Develop welding gas equipment involved in the welding process, such as cylinders, generators and valves.

(6) Perform research, design, and development of sea survival equipment, including solar stills, water distillation equipment, ration kits, life rafts, sea location markets, signaling devices, life preserver vests, and components thereof.

(7) Coordinate the design, stowage, and use of survival equipment with exits and other design features of aircraft pertaining to safety and the preservation of life.

(8) Devise, design, procure and aid in the development of test instruments, measuring devices, and other forms of instrumentation essential in determining the characteristics and performance of items of survival equipment.

(9) Fabricate experimental items of equipment.

(10) Assist in the preparation of specifications, prepare preliminary sketches, and initiate requests for final drawings, and submit information for handbooks, manuals, technical orders, and other publications on the above equipment.

Biophysics Branch:

(1) Conduct investigations on human tolerance to acceleration, deceleration and related phenomena and develop and test items of personal equipment designed to counteract effects of these forces.

(2) Evaluation of noise level requirements for aircraft and the effectiveness of noise protective equipment as it affects human efficiency.

(3) Human requirements involved in spatial problems associated with production aircraft and with suitability of size and shape of flying equipment.

(4) Conduct research on problems in biophysics, physics and engineering, of importance in aviation medicine, and to develop test equipment best adapted to physical and biophysical measurement.

Physiology Branch:

(1) Conduct studies in the human physiology and pathology of high altitude flight.

(2) Conduct studies of the nutritional and water requirements of flying personnel during normal operations and in emergencies.

(3) Develop and standardize goggles, sunglasses, eyeshades, and other general protective eye equipment.

(4) Study visual problems encountered using USAF equipment and advise other laboratories of the application of physiological optics to their own particular problems.

(5) Study and evaluate the physiological and thermal adequacy of USAF clothing.

(6) Study of physical requirements for temperature, humidity and ventilation for all types of aircraft as they affect the human body.

Psychology Branch:

(1) Determine the capacities of individuals to operate new types of equipment as an aid in the design of such equipment to the end that the final object will be best adapted to the man who must use it.

Medical Specialties Branch:

(1) Develop and standardize all aircraft medical equipment.

(2) Carry out any study where specialized medical training is a personnel prerequisite including the medical and safety implications of nuclear energy.

(3) Perform research, design, and development of land survival equipment, including emergency camping equipment, emergency kits, and components thereof.

Clothing Branch:

(1) Perform research, design, development, standardization, modification, and related engineering activities in connection with all flying clothing, including body clothing, air-conditioned clothing, and electrically heated clothing, headwear and footwear.

(2) Conduct research, design, and development of USAF luggage, camping bags, sleeping bags, hammocks, and electrically heated casualty blankets and components thereof.

(3) Coordinate the design, storage and use of flying clothing and equipage with exits and other design features of aircraft pertaining to safety and the preservation of life.

(4) Conduct research, design, and development of clothing peculiar to the needs of Army Air Force ground crew personnel, clothing for crash fire fighting, protective clothing for operating crews of USAF specialized equipment.

(5) Assist in the design, development and procurement of testing instruments, measuring devices and other forms of instrumentation essential in determining the characteristics and performance of all items of flying clothing and equipment.

(6) Fabricate experimental items of clothing and related equipment in connection with research and development of same.

(7) Assist in the preparation of specifications, prepare preliminary sketches and initiate requests for final drawings, and submit information for handbooks, manuals, technical orders and other publications on above equipment.

Affiliation and Liaison With Other Agencies: None.

Fiscal Information: FY 1950 . . . . . $ 1,493,600

3.2 Climatic Hangar and Physiological Test Facilities.

Location: Eglin Air Force Base, Florida.

History: The Climatic Hangar was completed in late 1946 and testing operations were begun in early 1947.

Mission: The U.S. Air Force requires that all aircraft, aircraft ground and personal equipment used by the Air Force operate satisfactorily under all climatic condition or be capable of operating satisfactorily after undergoing minor modifications. The operating temperature criterion sets forth a range from minus 65 degrees F to plus 165 degrees F. All design and manufacture must be directed towards operating under these conditions.

To meet the U.S. Air Force requirements and to insure satisfactory functioning of aircraft and equipment in all theaters of operation during all seasons of the year, a climatic testing program has been established. The function of this program is to test all aircraft and equipment to determine its satisfactory performance in extreme climatic conditions and its effective life when subjected to these conditions.

Command Relationship: The hangar is administered and operated by the Air Proving Ground Command.

Facilities for Research:

Testing Facilities. The Climatic Hangar project consists mainly of an insulated hangar 200 feet by 250 feet, 70 feet high; an equipment and engine test room 30 feet by 133 feet, 25 feet high; a cold test room, hot test room, desert test room, jungle test room, and tropic-marine test room, each 13 feet by 13 feet; an all-weather room for physiological testing, 13 feet by 34 feet; and a refrigerated stratochamber, 10 feet by 14 feet.

The temperature within the hangar and test rooms can be maintained within a range from minus 70 degrees F to plus 165 degrees F. Relative humidities can be maintained within a range of 10 per cent to 95 per cent or 1.5 inches mercury vapor pressure, whichever is lower when temperatures are maintained in the range of plus 50 degrees F to plus 165 degrees F. There is no provision for controlling relative humidities at temperatures lower than plus 50 degrees F. Provisions have been made for localized wind storms up to 100 mph in combination with sleet, snow, rain, dust, and sand. Artificial sunlight equivalent to noonday desert sun is provided. Thus, all normal and extreme climatic conditions can be simulated within the hangar or test rooms. There are no provisions for operating the hangar under reduced pressures; however, a refrigerated variable pressure chamber (stratochamber) is provided for high altitude and climb testing of personnel and personal equipment.

All-Weather Room

Purpose: This room is used for physiological proof testing of personnel and personal equipment under extreme weather conditions.

Description: The all-weather room is located on the ground floor of the north lean-to and consists of a main chamber approximately 34 feet by 13 feet by 11 feet high and an anteroom or entrance lock approximately 15 feet by 9 1/2 feet by 10 feet high. The main chamber is insulated with corkboard 12 inches thick, covered with a stainless steel interior liner. Large nonfrosting observation windows are provided for viewing testing from the outside.

Temperatures can be reduced in the main chamber from plus 70 degrees F to minus 40 degrees F in six hours, and to minus 70 degrees F in twenty-four hours. Temperatures can also be raised from plus 70 degrees F to plus 170 degrees F in two hours. The maximum relative humidities possible in the main chamber vary from 95 per cent at 65 degrees F dry bulb to 45 per cent at plus 165 degrees F dry bulb. The minimum relative humidity is 5 per cent. No provisions have been made for reducing the pressure within the room.

A rain and mist making apparatus is provided for simulating rainstorms from 1/2 to 15 inches per hour. Also, there is a built-in wind machine capable of air velocities of from 5 to 35 miles per hour. The room can be partially filled with water for the testing of life rafts, immersion suits, etc.

Provisions have been made for the future addition of sun lamps to simulate desert sun.

Stratochamber

Purpose: In conjunction with the all-weather room, a stratochamber is provided for the physiological proof testing of personnel and personal equipment at conditions simulating various altitudes and corresponding temperatures and under flight-climb conditions.

Description: The stratochamber consists of a main climb chamber and entrance lock, constructed of welded steel insulated with 13 sheets of a reflective metal insulation in the main chamber, and of 7 sheets in the lock. The chamber is constructed to withstand pressures from zero absolute to one atmosphere. Chamber size 9 1/2 feet by 13 1/2 feet by 12 feet high, lock size 10 feet by 4 1/2 feet by 12 feet high.

Temperatures can be reduced from plus 70 degrees F to minus 70 degrees F in 12 minutes after an initial pre-cooling of the chamber to minus 70 degrees F and reheating to plus 70 degrees F prior to test run, with ten men in heated suits in the climb chamber. Temperatures can be further reduced to approximately minus 94 degrees F with two men in heated suits in the chamber.

Pressure can be reduced to 87 millimeters mercury absolute (corresponding to 50,000 feet) in approximately 12 minutes with minus 70 degrees F in the climb chamber. Pressures can be further reduced to 25 millimeters corresponding to 80,000 feet altitude.

Miscellaneous Physiological Facilities

Complete physics laboratory, complete chemistry laboratory, dark room for physiological and photographic work, and a machine shop for repair and modification of various equipment used in physiological testing.

Small Test Room -- Hot, Cold, Jungle, Tropic-Marine, and Desert

Purpose: Because of the small size of these test rooms and as they are each equipped with individual air-conditioning systems, small items can be tested at much lower operating cost than when tested in the hangar or equipment and engine test room. The desert, jungle, and tropic-marine rooms can be operated for long periods at cycled night and day weather conditions. This will permit determination of the effects of long weathering on equipment and material.

Hot Test Room. 13 feet by 13 feet floor area. Designed for inside temperatures varying from plus 70 degrees F to plus 165 degrees F with relative humidities varying between 10 per cent and 95 per cent when the outside conditions vary between 25 degrees F and 50 per cent R.H., and 95 degrees F and 54 per cent R.H.

Cold Test Room. 13 feet by 12 feet floor area. The temperature in the cold test room can be reduced from 95 degrees F to minus 70 degrees F in 24 hours and can be held at minus 70 degrees F indefinitely with 10,000 pounds of test equipment in the chamber. Temperatures can be controlled at any degree from 50 degrees F to minus 70 degrees F. No humidity control is provided.

Jungle Test Room. 13 feet by 13 1/2 feet floor area. Conditions can be varied either way from 110 degrees F and 80 per cent R.H. to 90 degrees F and saturation in 2 hours to simulate cycling day and night jungle conditions. This room is provided with a rain system to simulate 12 inches per hour rainfall. Provisions will be made so that material can be infected with jungle molds and fungi.

Tropic-Marine Test Room. 13 feet by 13 1/2 feet floor area. Conditions can be varied either way from 105 degrees F and 50 per cent relative humidity to 70 degrees F and saturation within 3 hours time to simulate cycling of day and night conditions. 10,000 pounds of material can be subjected to these conditions. This room is equipped with a salt spray and rain-making system to give 12 inches per hour rainfall.

Desert Test Room. 13 feet by 13 feet floor area. The room conditions can be varied either way from 60 degrees F and 46 per cent relative humidity to 120 degrees F and 7 per cent relative humidity in 2 hours to simulate cycling of day and night desert conditions. This room is provided with sun lamps which will simulate daytime desert sun.

Medical Personnel:

Officers: 1
Enlisted: 0
Civilians: 0

Research Program and Research Projects: The medical program at present is limited to testing of medical items of equipment and clothing referred to the organization by other development units. Personnel are not available for an extensive physiological research program.

Project No.	Title
34784-5	Study of In-flight Meals and Their Preparation.
34840-5	Service Test of Clothing, Protective, for Crash-Boat Personnel.
34854-5	Operational Suitability Test of Helmet, Flying, Heavy, with Integrated Headset.
34863-5	Comparative Test of Bag, Nurses, Flying, Clothing, Type B-5, Redesigned, with Bag, Flying Clothing, Type B-4.
12472-5	Full Scale Ditching of B-17.
34758-2	Functional Test (Climatic Hangar Cold) of Suit, Flying Electrically Heated, Lightweight, one-piece.
34793-2	Functional Test (Climatic Hangar Cold) of Shoe, Flying, Heavy (Rubber Mukluk).
34817-2	Developmental Test (Climatic Hangar Cold) of Experimental Casualty Bag.

Affiliation and Liaison With Other Agencies: None.

Fiscal Information: Not available.

3.3 Deceleration Track.

Location: Muroc Air Force Base, Muroc, California.

Description: This facility is described under the Aero Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio, Section 3.1.

3.4 USAF School of Aviation Medicine.

Location: Randolph Air Force Base, San Antonio, Texas.

History: The United States Air Force School of Aviation Medicine originated as a direct result of War Department Special Order No. 243, Paragraph 113, dated 18 October 1917, which appointed a Medical Research Board to "investigate all conditions which affect the efficiency of military pilots and consider all matters pertaining to their selection and their physical and mental fitness."

The first action of this Board was to establish an Aeromedical Research Laboratory at Hazelhurst Field, Mineola, Long Island. In May 1919, a School for Flight Surgeons was added to train medical officers for duty with air units. In November 1919, this institution was moved to Mitchel Field, Long Island; in June 1926 to Brooks Field, Texas; and finally in October 1931 it was located at Randolph Air Force Base, Texas.

In 1921 the School was redesignated as the School of Aviation Medicine and became a special service school. On 1 April 1946 the School of Aviation Medicine was transferred from the Training Command and became a part of the Air University.

From a very small beginning the School of Aviation Medicine had a gradual but fairly constant growth until the early part of World War II. During the war period the expansion was rapid and it became necessary to establish branch schools at Santa Ana, California, Nashville, Tennessee, and at the San Antonio Aviation Cadet Center. At the end of the war all activities were again consolidated at Randolph Field, Texas.

The growth of this institution from the beginning of the war to the present time is evidenced by the fact that where one building formerly housed the school, it now occupies 59.

Mission: To conduct courses of instruction in aviation medicine, air evacuation and allied technical fields for selected Medical Department officers, nurses and enlisted men who are assigned to or on duty with the United States Air Force, and to carry out research for the United States Air Force in the field of aviation medicine except that having to do with the aeromedical aspects of aviation engineering.

Command Relationship: The School of Aviation Medicine is under the administrative control of the Air University, Maxwell Air Force Base, Montgomery, Alabama. The technical operation and control of the School is the responsibility of the Surgeon General of the Air Force.

Facilities for Research:

	Square Feet	Value
Administration Building (Research and Education)	10,698	$ 25,712
Research Laboratory	29,872	286,255
Dog Kennels	920	5,532
Storage (Research and Education)	62,665	151,864

Special Equipment:

Canadian Contact Link trainers modified for selection and classification of aircrew
Standard Link Trainers with special scoring devices
SAM Multidimensional Pursuit Tests
Stevens Pursuitmeter
SAM Pedestal Sight Manipulation Test
SAM Rotary Pursuit Tests
SAM Visual Coincidence Reaction Time Test
SAM Two-Hand Coordination Tests
Seashore Tridimensional Pursuit Test
Carstedt Plane Manipulation Test

SAM Rudder Control Tests
R-Meters
Geiger Counters-Scalars
Micro-Max Volt-Meter
Micro-Max Line Recorder
Minometer
Proteximeter
Ra-Be Neutron source - Portable Radiation Surveymeters
Micro Mell - Galvanometer
Clometers

Strumia cabinet lyophilizer
Spectrophotometer (Beckman)
Ultraviolet attachments for Beckman spectrophotometer
Flame photometric attachments for Beckman spectrophotometer
Warburg respirometer
Electroplating device for radioactive work
Polarograph (Sargent, recording)
Photofluorometer (Coleman)
Low Resistance Gasometers
Beckman oxygen analyzer

Low pressure chamber (1 man)
Low pressure chamber (15 men)
Parasite chamber (1 man)
Refrigerated low pressure chamber (15 men)
All-weather room
Model E-1 Maico audiometer for special types of testing
Sound conditioned rooms, with teletalk intercommunication
Beam-tone generator which can be directed into loud speaker or headset and attenuated
Noise generating equipment
RCA cathode ray oscillograph, 8 inches and same 3 inches
GR oscillograph recorder

Hewlett Packard square wave-generator, #210A
Hewlett Packard audio frequency oscillator, #200-C

General radio impedence bridge, Type 650-A
Klett Electrophoresis apparatus
Fisher-Stern Ultracentrifuge
Cambridge Research Electrocardiograph, Stethograph, Phonocardiograph and pulse recorder
Cambridge Plethysmograph
15 foot dropping tower equipped with recording oscillograph and strain gage used to study effects of deceleration forces on experimental animals
Swing for study of effects of motion on humans
Electroencephalograph, Grass Model IIA, 3 channel, 110-220V, 60C, AC

Vibration Analyzer Type 762-B General Radio Co.

Nagel Anomaloscope	--	Night Vision Tests
Color Threshold Meter	--	Photometers
Color Vision Multitester	--	Monochrometer
Color Lanterns	--	Spectrograph
Macbeth Illuminometer	--	Fog simulator
Ulbricht sphere		Depth Perception Tests
Zeis refractometer		Zeis Nordenson retinal camera
Stock-heinsius phorometer		2 steriocampimeters
Tangent screen illuminator - Rotoscope (special)		

Alphanumeric verifiers	Numeric punches
" punches	Interpreter
Horizontal sorters	Reproducers
Numeric collator	Alphabetical accounting machine

8	Aircraft, Type	L-13 A	
1	" "	L- 5 B	
1	" "	VB-25J	
6	" "	C-47	(Equipped for Air Evacuation)
1	" "	C-47	(Administrative)

Personnel:

Research Workers

Professional Officers	49
Professional Civil Service Employees	18
German Scientists	19
	86

Supporting Personnel[3]

Officers	59
Civil Service Employees	60
German Civilian Employees	7
Enlisted Personnel	409
	535

Consultants 4

[3]Includes all administrative, supply, and other personnel employed in housekeeping functions, as well as sub-professional type civilian and military personnel who directly support the research and educational missions of the USAF School of Aviation Medicine.

Background Information on Civilian Scientific Investigators.

Harry F. Adler, A.A., University of Chicago 1934. Assoc. in Arts; B.S. University of Chicago 1937. Physiology; M.S., University of Chicago 1938 Physiology; Ph.D., Northwestern University 1941 Physiology and Pharmacology; M.B., Northwestern University 1944; M.D., Northwestern University 1945; Director, Medical Sciences Division. Special interest: Aviation Medicine (Aviation Physiology).

Herman I. Chinn, B.S., M.S., Ph.D., Northwestern 1938 Physiological Chemistry. Director, Department of Pharmacology and Biochemistry. Special interests: Aviation Pharmacology and Biochemistry.

Albert W. Hetherington, Jr., B.S., University of Arizona 1936 Zoology; M.S., Northwestern 1937 Neurology; Ph.D., Northwestern 1939 Neurology; Director, Dept. of Physiology. Special interests: Aviation and environmental physiology, anatomy, physiology, and endocrinology of the nervous system.

Roland B. Mitchell, B.S., North Texas State College 1932 Biology and Education; M.A., University of Texas 1937 Bacteriology; Ph.D., University of Texas 1939 Bacteriology; Director, Dept. of Aerobiology. Special interests: Research and teaching in the fields of aerobiology, public health bacteriology and epidemiology, immunology and diagnostic bacteriology.

Saul B. Sells, A.B., Brooklyn College 1933 Psychology and Economics, Ph.D., Columbia 1936 Psychology. Director, Dept. of Clinical Psychology. Special interests: Psychology and Statistics, reasoning, personality and adjustment, vision.

James A. Rafferty, B.S., Harvard 1943 Biochemistry; M.D., Rochester 1946 (Honors thesis in Statistics). Director, Dept. of Biometrics. Special interests: Biometrics and biomathematics.

Paul E. Fields, A.B., Ohio Wesleyan University 1926 Psychology; A.M., Ohio Wesleyan University 1927 Psychology; Ph.D., Ohio State University 1930 Psychology; National Research Council Fellow Stanford University 1930-32 Psychology; Aviation Psychologist. Special interests: Psychology.

Shannon C. Allen, A.B., Stanford University, 1932 Political Science; Ph.D., Stanford University, 1942 Physiology, Research Physiologist. Special interest: Cardiovascular physiology and temperature regulation.

Milton B. Jensen, A.B., Utah State 1923 Educ. Psychology, A.M., Stanford 1925 Ed. Psychology, Ph.D., Stanford, 1927 Ed. Psychology, Clinical psychologist. Special interest: Clinical psychology.

Allyn W. Kimball, Jr., B.S., University of Buffalo, 1943 Statistics. Expects Ph.D. degree University of North Carolina 1950 Experimental Statistics; Analytical Statistician. Special interest: Mathematics, statistical design and analysis of experiments.

Fred W. Oberst, B.A., West Texas State College, Canyon, Texas, 1927 Organic chemistry. M.S. State University of Iowa 1928 Organic chemistry. Ph.D. State University of Iowa 1930 Organic chemistry, Pharmacologist-biochemist. Special

interest: Drugs in aviation medicine, problems in acclimatization to high altitudes and to low temperatures, biochemistry in aviation medicine.

Henry B. Hale, B.S., Iowa State College, 1936 Zoology, M.S., Iowa State College 1939 Physiology; University of Cincinnati 1944 Endocrinology, research physiologist. Special interest: Endocrinology.

Louis E. Moses, A.B., University of Toledo 1930 Biology, Ph.D., University of Chicago 1943 Physiology; M.D. University of Arkansas 1949, research physiologist. Special interests: Aviation medicine, endocrinology.

Syrrel S. Wilks, B.S. North Texas State Teachers College 1927 Chemistry; Ph.D. University of Texas 1936 Physiology, research physiologist. Special interest: Physiology of respiration.

Research Program: The research scope of the school covers all problems in aviation medicine of concern to the United States Air Force, except those that have to do with the aeromedical aspects of aviation engineering. Among the various problems dealt with by the school are those connected with the selection of candidates for flying training, classification of cadets, flying training methods, physical fitness, leadership, morale, rehabilitation, disease and injuries peculiar to flying, mental hygiene, eustachian tube irradiation, medical indoctrination of flying personnel, air crew maintenance, flying safety (medical aspects), air evacuation, medical tactics of the Air Force, and the development of medical examining and hospital equipment peculiar to the Air Force.

Affiliation and Liaison With Other Agencies: None.

Fiscal Information: FY 1950 . . . . . $ 960,000

4. ARMED FORCES FACILITIES

4.1 Engineering Development Division, Armed Services Medical Procurement Agency.

Location: Fort Totten, Bayside, Long Island, New York.

History: The Engineering Development Division of the Army-Navy Medical Procurement Office was established on 28 May 1946, by joint direction of the Surgeon General, United States Army and the Chief of the Bureau of Medicine and Surgery, United States Navy to function under the command of and as a component to the Army-Navy Medical Procurement Office.

Mission: To study and develop the design and construction of new items, the correction of defects and drafting of specifications; to undertake study of and make recommendation on materiel characteristics of items reported to be unsatisfactory; to effect improvements in packaging, packing, and crating.

Command Relationship: Command supervision is invested in the Commanding Officer of the Armed Services Medical Procurement Agency.

Facilities and Special Equipment:

Plant Area (Acres)	1 Acre (approx.)
Floor Space	32,450 square feet
Office	1,792 " "
Laboratory[4]	250 " "
Shop	13,364 " "
Other	17,244 " "
Facility Value -	Land undeterminable
Buildings	$500,000 (est.)
Equipment	400,000 (est.)

The shop space includes:

Metal working shop
Wood working shop
Paint working shop
Plastic working shop
Foundry
Drafting rooms

All the shops and work rooms are adequately equipped with modern machines.

[4]The Engineering Development Division has access to the facilities of the Laboratory Branch, ANMPO and occupies 250 sq. ft. of space in the ANMPO building at 84 Sands Street, Brooklyn 1, New York, in addition to the space at Fort Totten.

Personnel:

Officers	-	6
Enlisted Men	-	9
Civilian		
Graded	-	21
Ungraded	-	15

Background Information on Civilian Scientific Investigators.

Joseph A. Colamari. Technologist. B.S. Polytech Institute of Brooklyn, 1932; M.S. Polytech Institute of Brooklyn, College of Engineering, 1933; Undergraduate course in Economics, N.Y.U.; Graduate course in organic chemistry and photochemistry, N.Y.U. 1934; Special interest: Organic chemistry.

Clare L. Milton, Jr. Technologist in Plastics. B.S., Harvard 1939. Special interest: Plastics.

Benjamin D. Pile, Medical Equipment Electrical Design Engineer. B.S. Kansas State College, 1935. Special interest: Electrical engineering.

Anthony A. Larussa. Medical Equipment Design Engineer. Cooper Union College, N.Y. 1920-22 Mechanical Engineering. Hebrew Technical Institute 1922-25 Industrial Engineering; Chicago Technical Institute 1925-27 Industrial Engineering; University of Wisconsin 1942, Packing Engineering. Special interest: Industrial engineering.

Affiliation and Liaison With Other Agencies: None.

Fiscal Information: FY 1950 . . . . . $ 206,028

5. SUMMARY OF FISCAL INFORMATION OF ARMY, NAVY, AND AIR FORCE FY 1950.

	FACILITY	FY 1950	
1.1	Mexical Division, Army Chemical Center	$ 1,167,000	
1.2	Army Medical Research and Graduate School	314,915	
1.3	Army Prosthetic Research Laboratory	70,000	
1.4	Climatic Research Laboratory	211,000	
1.5	Medical Department Field Research Laboratory	628,391	
1.6	Medical Nutrition Laboratory	243,520	
1.7	Surgical Research Unit	82,405	
1.8	Tuberculosis Research Laboratory	56,380	
			2,773,611
2.1	Aero Medical Equipment Laboratory	30,000	
2.2	Artificial Limb Shop	22,000	
2.3	Medical Field Research Laboratory	118,000	
2.4	Naval Medical Research Institute	820,500	
2.5	Physiological Test Section, NATC	7,000	
2.6	Naval Medical Research Unit No. 4	134,500	
2.7	Naval Radiological Defense Laboratory		
2.8	Naval School of Aviation Medicine and Research	87,000	
2.9	U. S. Naval Medical Research Laboratory	40,000	
			1,259,000
3.1	Aero Medical Laboratory	1,493,600	
3.2	Climatic Hangar and Physiological Test Facilities		
3.3	Deceleration Track		
3.4	School of Aviation Medicine	960,000	
			2,453,600
4.1	Engineering Development Division, Armed Services Medical Procurement Board and Agency	206,028	206,028
			6,692,239